ELECTRICAL WEST

A McGRAW-HILL PUBLICATION

November 1960
50 Cents

Power for Peaking

REMEMBER
THIS
ADVERTISEMENT?
Where is the Guy who put up this guy?
This STRANDVISE guy was put up complete before any tensioning tools were applied to the strand
We found the missing Guy...
Here he is, doing another job with Strandvise...
in 5 short minutes and all by himself!
This man knows the safest, fastest, easiest way. He has deadended his guy at all points. It is complete, but slack. NOW he applies tension . . . and NOT UNTIL NOW. Tools have never been in his way.
Reliable
ELECTRIC COMPANY
11333 Addison Street • Franklin Park, Illinois
A Symbol of Integrity Since 1909

editorial views EW

WE DIDN'T GET TO VOTE FOR PRINCIPLE

You know now who won the election. For many people, the election spectacle has been a disappointment. We have not been confronted with basic issues, we have not been able to vote for principle—only the lesser of evils. Two brilliant young men have engaged in a national Santa Claus contest convinced that we are more loyal to ourselves as Negroes, Catholics, aged, farmers, union members than we are to ourselves as Americans.

Reality

Be practical. A politician's first duty is to be re-elected. The fabric of America is the warp and the woof of selfish interest. Management vs labor vs government vs the consumer. It's one grand melee. Hurrah for me and to hell with you.

This too is reality. We are 15 minutes by missile to or from Moscow. The wherewithal for world annihilation is broadly held.

The balance of world power lies in the hands of newly emerging nations.

These peoples want material things and will follow whichever system is most productive.

We are in open and declared economic conflict with world Communism!

The Material Issue—Quemoy and Matsu, putting a Negro on the cabinet, even our beloved power, are not key issues. This is political babble used to obfuscate the key issue of economic superiority and survival.

Our political contenders have not mentioned that America is being priced out of the world market. Indeed, we can't afford to do business with ourselves. Radios, cars, cameras, steel, plywood, clothes—the list is endless—where foreign equipment undersells American goods. *But growth is only real where the products of growth can be sold here and abroad.* When we can't sell our products, we lose our gold. *The loss of American gold to foreign countries is a measure of economic defeat!* When it's gone, all the paper dollars in the world won't replace the hub cap on your Volkswagen!

Moral Question

Underlying the material struggle is the moral question of whether America will *freely* muster the resolve to match the purposefulness of world Communism. A first step toward resolve must be a clear understanding of the nature of our conflict—economic literacy. How have our candidates measured up? Does it seem possible that these men could face their Maker and swear their every promise would serve the best interests of the country? There has been much said about Catholic and Quaker boys as presidents. But too little discussion as to whether the stands of these political sons reflect credit as measured by *any* Christian doctrine. And if not, why not?

Platform for '64—Our politicians have to speak simple, full truths. No qualification. Management has got to be more ingenious. Labor has got to produce more. Government has got to shrink. Taxes have got to go way down. No kowtowing to the farmer, to labor, to business, to racial groups. Let's stop trying to buy the world's favor. Let's make the Hoover report a plank. Let's stop being afraid. Let's shave Castro. *We have got to compete, whatever the sacrifice.* I think there is enough latent patriotism to make it stick.

It's a swell idea, but we didn't get to vote for it this election.

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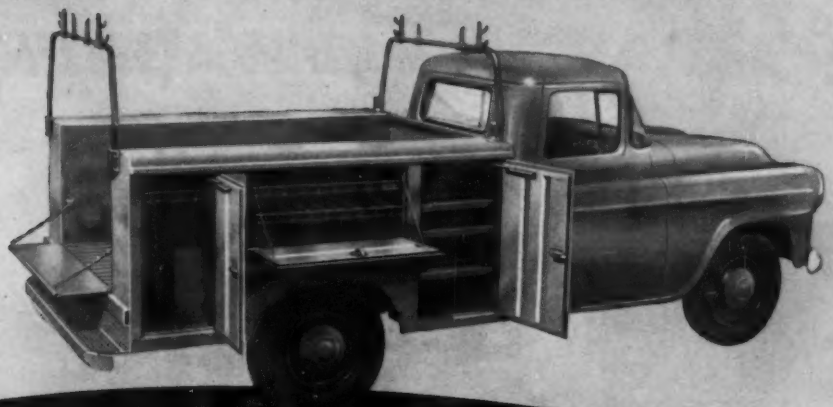
SERIES 22

SERVICE AND MAINTENANCE BODIES



Four Models... Four Sizes

COMPARTMENTIZED TO FIT SPECIFIC JOB NEEDS

Which Series 22 Body do you need? Take a look . . . there's a model especially designed for your particular type of service work. The durable, all-steel unit shown above, equipped with an optional overhead rack, is widely used for general service work in all operations. Other models for electric, telephone and gas service have similar compartments fitted with various shelves and bins to meet specific work needs. Result: You get a custom-made body at a mass-produced price . . . plus increased crew efficiency on every job.

Series 22 Body features include flat, 16-gauge compartment tops . . . rust-proof, cadmium-plated door latches . . . nylon bushings in all door hinges . . . key-locking, weathertight doors . . . recessed, slam-action door catches . . . corrugated steel floor.

Available in 75", 90" and 104" lengths, equipped with accessories to fit your particular need.

Need more storage space? Any of the four Series 22 models can be furnished with an all-steel superstructure. In addition to any optional items desired, the superstructure is fitted with two full-length shelves and three swivel hooks on each side, a window in the head panel and grab handles at the rear.

Self-Elevating Ladder Assembly

This time-saving assembly with six rubber-covered rollers and four powerful coil springs enables one man to quickly and effortlessly erect a ladder up to 36' in length. The operator lightly pushes the end of the ladder down, and the springs do the lifting. Stowing is equally fast and easy. Ideal for use on 75", 90" and 104" bodies. Includes 28', 30', 32', 34' or 36' two-section extension ladder.

FOR ELECTRIC WORK

Series 22-E. Designed for service work in any phase of the electric utility industry. Special shelves and bins carry all the equipment and materials needed in the field.

FOR TELEPHONE WORK

Series 22-T. Compartmentized to carry a variety of telephone service tools, parts and materials. Standard arrangement of shelves and bins enables crewmen to quickly find items needed on the job.

FOR GAS WORK

Series 22-G. Two variations of this model are available for carrying either cast or tin meters. Rubber-padded compartments insure the safe storage of fragile parts and instruments.

Plenty of additional bins, shelves and racks carry tools, pipe, fittings, parts and all other equipment needed on routine or emergency service and maintenance calls.

Another reason why
UTILITIES EXPECT MORE FROM

POWERS American

UTILITY BODIES AND EQUIPMENT

McCABE-POWERS BODY COMPANY

5900 No. Broadway	625 Cedar Street	1461 E. Washington Blvd.	5525 S.E. 28th Ave.
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Get more usable Kva for your

with WAGNER®

SERVING 2 GREAT GROWTH INDUSTRIES—*ELECTRICAL...AUTOMOTIVE*

distribution transformer dollar

HI-THERMAL-CAP *TRANSFORMERS*

Every dollar you invest in Wagner® HI-THERMAL-CAP Transformers really buys a dollar and twelve cents worth of usable Kva. For you can safely uprate these High Capability Transformers to 112% of their nameplate Kva without shortening normal life expectancy . . . without exceeding the allowable 65°C hot spot temperature rise.

HI-THERMAL-CAP Transformers have new, compact coils wound LV—HV—LV on one insulating cylinder. Corrugated oil ducts and thermosetting barrier insulation lock the sections into a unit of great mechanical strength. Coils have been subjected to short circuit tests using 50 times normal current (two times as great as the industry standard) without failure.

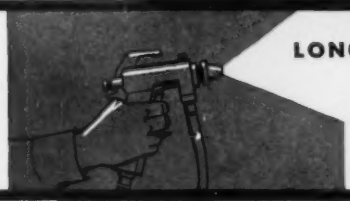
The HI-THERMAL-CAP element, which combines this improved coil with a wound core of cold-rolled oriented grain steel, has excellent electrical characteristics: low impedance for better voltage regulation; low core and copper loss for economical operation. You get full efficiency plus high capability with new Wagner HI-THERMAL-CAP Transformers.

HI-THERMAL-CAP Transformers, built in single-phase ratings 167 Kva and smaller, 15 KV and below (for direct pole mounting), are now available from factory, branch, and distributor stocks. Your Wagner Sales Engineer has complete information. Consult him, or write us.

MORE FOR YOUR MONEY IN MECHANICAL FEATURES:

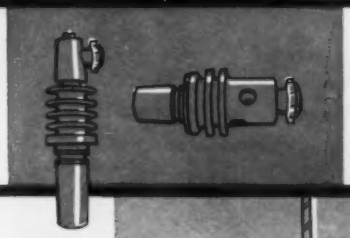
PLASTIC-COATED COVER

A porcelain-like coating gives improved corrosion resistance to tank covers, protects from line to ground, insulates small animals from the grounded cover to prevent outages. Applied to the covers, clamping ring and cover bolts, it is available without extra cost on all transformers with cover mounted bushings.



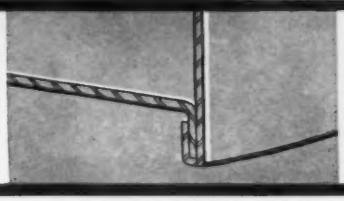
LONG LASTING TANK FINISH

A new formula anti-corrosive paint, carefully applied and thoroughly cured, provides a "Sure Seal" finish that withstands all temperature changes—is much longer lasting in corrosive atmospheres.



SAFETY KEYED BUSHINGS

Heavy wet-process porcelain high voltage bushings are safety-keyed. All terminals are key-locked in the tank wall. Hand tightening terminals are easily hooked up without tools. All bushings are suitable for use with either aluminum or copper conductor.



ROLLED-UNDER BASES

This new base design provides extra strength . . . better moisture drainage. Serves as an additional safeguard against leakage of oil from the tank. It lessens the chance for finish damage due to scraping.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation

6381 PLYMOUTH AVENUE, ST. LOUIS 33, MISSOURI

WT60-20

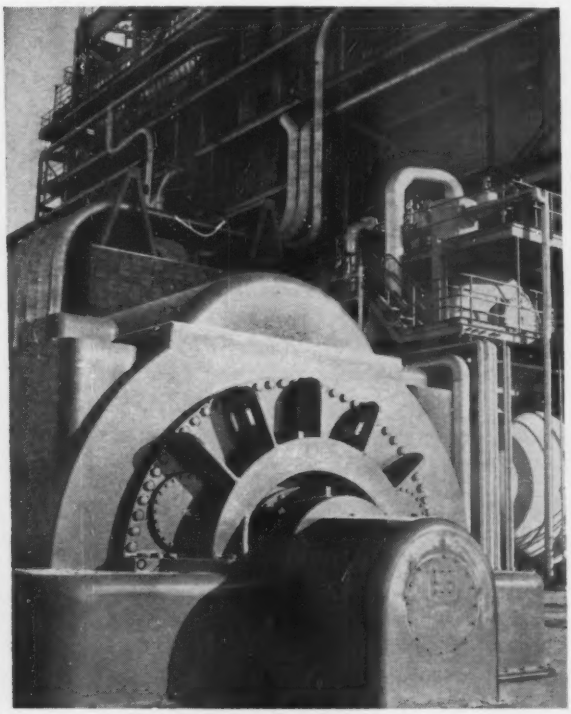
For phone number of closest representative see advertising index in back of book.

STANDARD ENGINEER'S FIELD REPORT

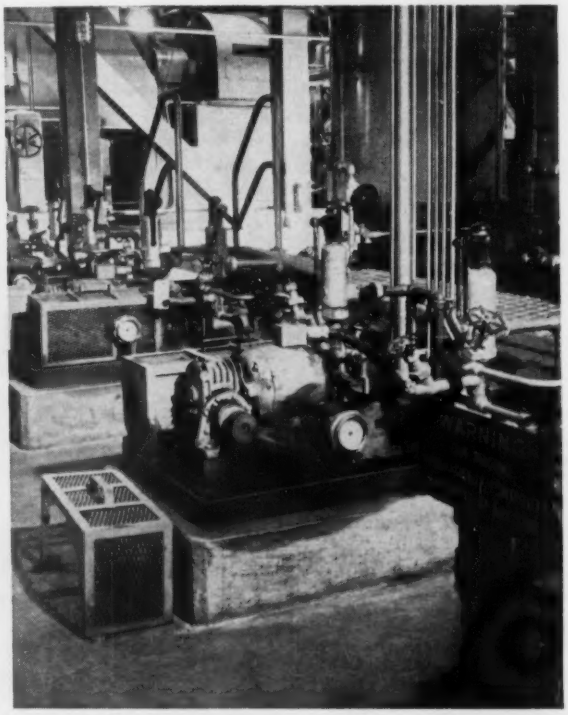
PRODUCT **Chevron Industrial Grease**

FIRM **Alamitos Steam Station Southern California Edison Co.**

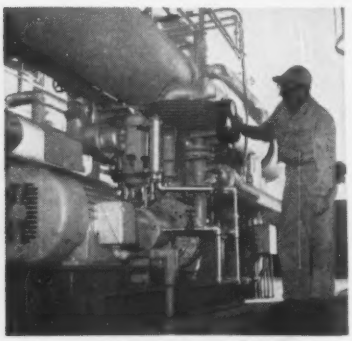
Chevron Grease replaces four at Alamitos Station

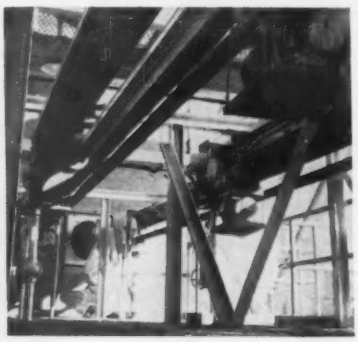


Instead of 4 different greases frequently used in large steam generating plants, Southern California Edison Company's up-to-the-minute, 350,000 KW Alamitos Steam Station (above) meets all its needs with versatile Chevron Industrial Grease.



Rust protection of Chevron Industrial Grease and its unusual water resistance make it ideal for lubricating bearings of chemical feed pumps and their motors (above). Pumps feed Hydrazine to condition boiler water before it enters tubes.





Maintenance is simpler and there's no chance of error using same lubricant for sump pumps (left), boiler cleaning lances (right) and all other greased equipment. Firm selected Chevron Industrial Grease for Alamitos as a result of several years satisfactory performance at their Terminal Island Station.

Why Chevron Industrial Grease provides Superior Lubrication

- Top wear-prevention qualities
- Unusual water resistance
- Rust protection
- Non-corrosive
- Mixes with any grease
- High work stability
- Melting point, 500°F. plus
- Pumpable over wide temperature range

For More Information on this product contact your Standard Engineer or Representative or write 225 Bush St., San Francisco 20, Calif.

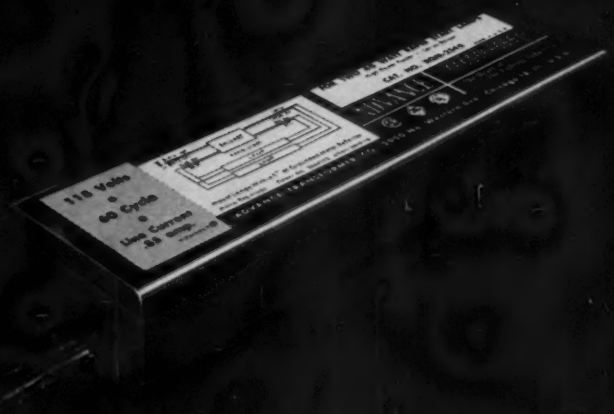
CHEVRON Industrial Lubricants

TRADEMARK "CHEVRON" AND CHEVRON DESIGN REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA

ANOTHER ADVANCE FIRST!

SOUND RATED



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Again ADVANCE TRANSFORMER CO. brings the lighting industry another outstanding development in ballast design . . . an **"A"** sound-rated Two-lamp 40-watt Rapid Start Ballast. ADVANCE engineers developed this acoustically corrected ballast that absorbs the magnetic vibration of core and coil before it becomes sound.

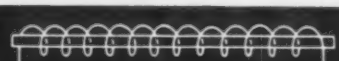
By controlling vibration, the noise level of the new ADVANCE sound-conditioned ballast is lower than any Two-lamp 40-watt Rapid Start Ballast available today.

For silent fluorescent lighting in schools, libraries, hospitals and other critical areas where low noise levels are the primary consideration . . . demand ADVANCE **"A"** quiet-rated fluorescent lamp ballasts.

"The Heart of the Lighting Industry"®

Mfg. in Canada by: Advance Transformer Co., Ltd. 5780 Pare St., Montreal, Quebec.

ADVANCE®



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World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts

TRANSFORMER CO.

2950 NO. WESTERN AVE. CHICAGO 18, ILL. U.S.A.

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LOW OVERALL COST DEMAND MEASUREMENT

D OES IT LOGICALLY

The Duncan Thermal Demand Meter follows the same general heat-time curve that determines system capacity.

U NNECESSARY PARTS ELIMINATED

Long, reliable service is assured by a design using one moving part — moving only when the load changes.

N O CALIBRATION PROBLEM

Only one adjustment for up-scale point. Adjustments of the watthour meter do not affect the thermal accuracy.

C APACITY TO MEET YOUR NEEDS

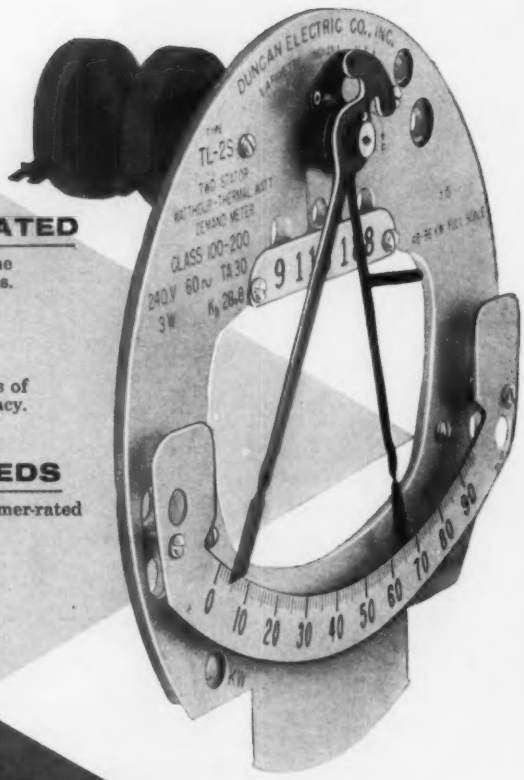
Available in a full line of self-contained and transformer-rated meters. Maximum range to 200 amperes.

A CCURACY MATCHES LOAD

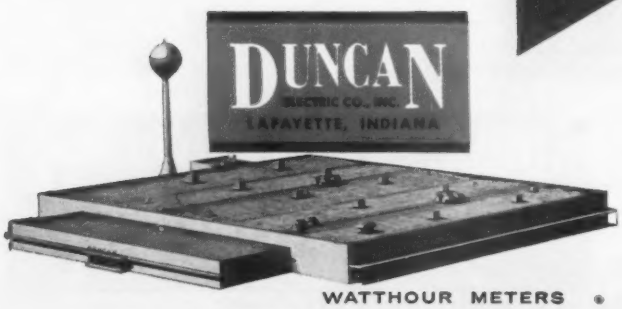
The Thermal Demand Meter does not split peaks. It measures actual demand.

N O LARGE INVENTORY

Dual range scale combinations available to cover most rate structures with a minimum of meters.



THERMAL METERS



"Thinking Ahead ... Moving Ahead ... to stay Ahead of Demand"

WATTHOUR METERS • MOUNTING DEVICES • DEMAND METERS

For phone number of closest representative see advertising index in back of book.

".....we knew you would want all these switchgear advances. And we were determined to bring them to you at the lowest possible cost."

—Frederick G. Schmidt, Manager Switchgear Division, I-T-E Circuit Breaker Company

Frankly, we had a big decision to make when we were designing this new HK metal-clad switchgear. Should we go ahead with a complete redesign or should we simply add the new features we knew you wanted to our previous models? The latter would have been easier, and it still would have put us well ahead of the field. But we decided it would be more honest to give you the benefit of as much progress as possible as soon as we could. And we were confident that in this case we could give you all these advances at a price no higher than you would pay for equipment with none of them.

First we wanted to give you stored energy closing. No circuit breaker in this class can really be called modern today without this feature. It insures that you can have fast, uniform closing every time. In fact, I-T-E makes it possible for you to close the breaker even during emergencies when you have lost control power. Fast closing reduces breaker upkeep—prolongs contact life. And I-T-E's motor-driven spring charging mechanism needs only about one-tenth the power of other devices. So you can enjoy the economy of a smaller battery or control transformer.

To give you still greater safety too—again with no increase in cost—we designed this switchgear so you never need open the doors to move the breakers. You can go all the way from connected through test position, to disconnected, and back again with the door closed.

Where else can you find safety like this in metal-clad switchgear? Even an inexperienced man can operate it in complete safety. Because we were designing this equipment completely new from the ground up, we had the opportunity to make the components more accessible and provided more elbow room inside the compartments. The bus is higher, for example, making installation and inspection easier. The control cables are brought in at the front for convenience and safe access away from the high-voltage bus. The current transformers are located behind the shutter in the circuit breaker compartment and may be easily changed without disassembling the bus or cable connections.

We were meticulous from the beginning about taking full advantage of the many new materials now available for switchgear use. And through careful selection of materials, skillful arrangement of components, and shrewd economy of space, we were able to give you all these advances in a substantially smaller package as standard equipment. The gear fits under lower overheads and in narrower aisles. Yet it gives you actually more usable space inside than you had before. Circuit breakers are lower, lighter and easier to handle. Instruments are at eye level. We believe you will agree there is no finer switchgear available today anywhere.

A complete description of this equipment is contained in our new illustrated Bulletin 2801-2A. Send for your copy. And ask to see our new sound strip film. We'll bring it to your office. You can see it in 18 minutes. I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Philadelphia 30, Pa.

For phone number of closest representative see advertising index in back of book.

MU-20 2000 KW Diesel
MU-14DF 1000 KW Dual-fuel

MU-40 4000 KW Diesel
MU-28DF 2000 KW Dual-fuel

MU-60 6000 KW Diesel
MU-42DF 3000 KW Dual-fuel

MU-80 8000 KW Diesel
MU-56DF 4000 KW Dual-fuel

MU-100 10,000 KW Diesel
MU-70DF 5000 KW Dual-fuel

From Public Service Co. of Oklahoma . . .

Improved Power Service To Grandfield, Oklahoma

In the Southwestern corner of Oklahoma, Grandfield lies at the end of a long 33,000 volt transmission line that starts at Lawton, Okla. 32 miles away. To bring improved customer service to this growing community, Public Service Company of Oklahoma installed a 2000 KW Electro-Motive Diesel plant in June, 1960, to provide area protection and peaking service.

New Plant Proves Its Value

The value of the Electro-Motive plant for area protection was proved only one week after its installation when one of Southwestern Oklahoma's sudden, severe storms caused a loss of power on the line from Lawton. Within 60 seconds, the Electro-Motive plant automatically started, came up to full speed and was supplying Grandfield with adequate power. Again, on August 9, during a period of peaking operation, the 33,000 volt transmission line suffered an outage due to an electrical storm. Automatically the Electro-Motive plant switched from peaking service to isolated operation to supply the area with emergency power.

Maximum Area Protection

The Grandfield area served by Public Service Company now gets maximum area protection in case of line outage because of the special dead load pick-up feature built into the Electro-Motive plant. It can pick-up a dead load with starting inrush at five times its rated KVA and come back up to full voltage and a steady state condition in 30 seconds. And, the plant will continue to supply power for this load as long as required.

Remote Control Operation

The Electro-Motive plant at Grandfield operates as a peaking unit by remote control. During periods of heavy power use, the unit can be brought on the line from a remote location. On this signal, the unattended plant automatically starts, synchronizes and goes on line in less than two minutes.

Adaptable To Many Functions

The inherent design characteristics of the Electro-Motive equipment at Grandfield that make it ideal for peaking and area protection also make it possible for Public Service Company to add additional generating units in the future to bring the plant up from 2000 KW to 8000 KW. And, they can do this at low incremental cost when load growth occurs. These characteristics of Electro-Motive plants make them best suited for many of your system requirements, too:

- fast start for spinning reserve
- automatic dead load pick-up for area protection
- unattended operation for remote peaking service
- portability for simple installation
- freedom from damage to components caused by rapid thermal changes occurring from start to full load

Available in units from 2000 KW to 10,000 KW, the Electro-Motive peaking equipment line contains both Diesel and dual-fuel plants that can permit matching the plant to exact requirements for the most economical and efficient operation at the lowest investment. Ask your Electro-Motive representative for complete details.

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS La Grange, Illinois

Sales-engineering offices: Chicago, New York, St. Louis, San Francisco

In Canada: General Motors Diesel Limited, London, Ontario

Are the appliances you want most in the new home you plan to buy?

Every MEDALLION HOME has an all-electric kitchen with electric range and oven—and more from this list of additional appliances:

Electric DRYER
Electric WASHER
Electric DISHWASHER
Electric REFRIGERATOR
Electric WATER HEATER
Electric GARBAGE DISPOSER

The Medallion award on a new home guarantees you major electrical appliances, already installed. And you get ample wiring ... full Housepower for future needs ... *plus* lighting which is both functional and beautiful.

So look for the Medallion—national symbol of better housing and modern electric living. It identifies today's best new-home buys in every style, size, location and price range. No family should buy a home without the Medallion Home award.

SOUTHERN CALIFORNIA Edison COMPANY *helps you* LIVE BETTER—ELECTRICALLY

NEW

NEW

NEW

Announcing . . .
the new, improved . . .

MOLONEY

Distribution
Transformers

MOLONEY ELECTRIC

Now the best is Better for '61 →

COMPARE COMPARE COMPARE

So that you may decide for yourself . . . examine the design of new improvements . . . review the features which were retained . . . compare *all* of the advantages of Moloney Transformers with competitive units. You will agree that these new improvements—combined with features that have been retained . . . add up to the best total value for your transformer dollar.

NOW THE NEW MOLONEY DISTRIBUTION TRANSFORMERS

Presently Available In Conventional And CSP Types Through 100 KVA

NEW DESIGN FEATURES

1. A deep-drawn, crowned cover—has smooth rounded surfaces which readily shed moisture and are devoid of places where corrosive material accumulates. Of great importance on transformers having cover mounted bushings, is the increased distance from the crown of the cover to the mounting band. This, when combined with Duracoat Insulation, provides maximum protection against outages due to birds, etc.

2. Internal cover grounding and positioning method—for Duracoat insulated covers. A captive phosphor-bronze spring positions and automatically grounds the insulated cover to the tank, to prevent radio frequency interference and eliminate shock hazards to linemen.

3. Cover clamping band—provides uniform pressure around the entire circumference of the cover. Clamping is done by a stainless steel bolt whose swinging hinge action permits ready removal of the cover. There is no chance of dropping parts of the clamp, since all parts are captive.

4. Numerous weep openings—are formed in the clamping band to prevent water being trapped in the band.

5. Handhole cover having a single center bolt closure—facilitates entry into the tank—exerts uniform pressure on the corprene sealing gasket. The clamping bolt has a large square head requiring less force to turn the bolt and has rounded corners to protect its plastic coated surface from damage during installation or removal of the handhole cover. Pressure is exerted on the gasket by means of an internal bar captive on the bolt and held in place by a welded stop. When the handhole cover is removed all parts remain attached, thus preventing them from being dropped. The transformer is sealed at the closure-bolt opening by a nylon sealing gasket which is protected by the flanged underside of the bolt head.

6. New lifting hooks—have a smoothly contoured lower surface to prevent sling abrasion. This hook is designed to permit use of cable or rope slings even on the smallest of transformers without damage to bushings.

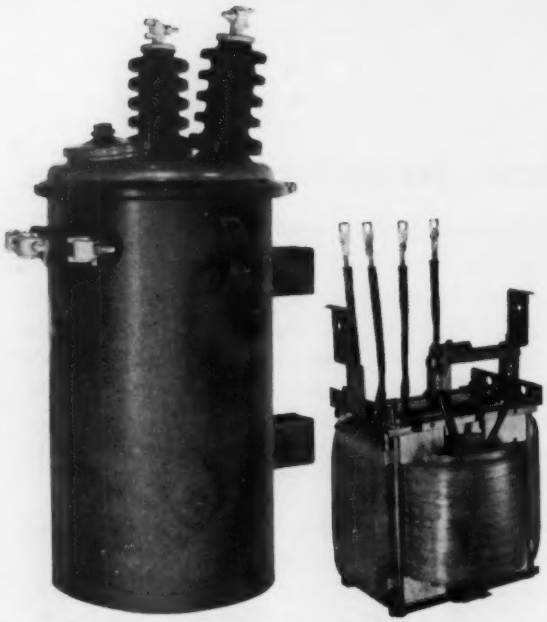
7. Stronger tank top rim—obtained by rolling approximately 400° to give greater resistance to distortion when coverless transformers are lifted without a spreader and with short slings. This new rim retains our previously proved cover gasketing system in which the cover gasket fits on the top of the rim, not on the side, where it could trap oil along the top edge of the tank.

8. The three-point suspended core-and-coil assembly—prevents pressure contact of core-and-coil with the tank bottom and thus achieves a reduction in sound level. The top two points of the suspension system each consist of two conically matched surfaces, one on the framing—the other on the tankwall, on each side of the transformer. These conical surfaces are bolted together, they prevent shear on the bolt while still supporting the weight of the transformer.

9. High strength frame design—maintains eight-point blocking of coils and increases short circuit withstand.

10. Steel shipping band—connected to the lifting hook to secure the transformer on the shipping pallet and thus facilitate handling of the palletized transformer by fork lift trucks.

11. Wire bound, wooden slat protective enclosure—nailed to the pallet. This enclosure has been exhaustively pre-tested and has great strength to permit stacking. One of the advantages of this enclosure is that it may be easily stripped away, leaving only the palletized transformer. This will reduce the time required to install the transformer, and also reduce the amount of scrap material at the job site.



THE NEW MOLONEY DISTRIBUTION TRANSFORMERS

Presently Available In Conventional And CSP Types Through 100 KVA

PLUS THESE RETAINED DESIGN FEATURES:

The Moloney Core, with its inherently low exciting current —low core loss — low sound level. • Low impedance design, resulting in improved voltage regulation. • High short-circuit strength so necessary in the low-impedance design, results from the use of resin-coated paper in the consecutively wound coils, and the eight-point blocking system. • Extra insulation at all line ends and other vulnerable points in the coil. • Duratherm insulation, a high-temperature insulation which permits operation at increased KVA, or increases transformer life expectancy. • Liberal use of cooling ducts, resulting in a low temperature gradient, high overload capability. • Vinyl tubing around all leads where they pass through the coil. • Inhibited oil. • High impact strength — liberal creepage bushings resist damage. • Internal clamping of all bushings, to prevent corrosion at these points. • Special-design bushing opening and mounting hardware, to prevent radio frequency interference. • Connectors — electro-tin coated, and large enough to accommodate the ACSR equivalent of copper conductors specified by EEI-NEMA Standards. • Triple-thick tank bottom rim, for added protection. • Duracoat insulated covers to provide protection against outages. • Retained gaskets at all openings, to minimize the possibility of moisture or air entering the tank. • Patented, automatic, electronic testing, your certified assurance of high quality and superior performance in every distribution transformer that is shipped. • Moloney's combination of balanced design features results in the highest value for your transformer dollar . . .

COMPARE THESE FEATURES . . . Plastic Coated, Deep-drawn Cover • Internal Cover Grounding • Cover Clamping Band • Water Shedding Weep Openings • Center Bolted Handhole Cover • New Lifting Hooks • Hercules Tank Rim • Three-point Suspension Of Core-and-Coil Unit • High Strength Frame • Steel Banded Palletized Unit • Removable Protective Shipping And Stacking Enclosure • Low-loss, Low-exciting current Moloney Core • Low Impedance • High Short-circuit Strength • Extra Insulation • Duratherm Insulation • Low Temperature-gradient • High Overload Capacity • Vinyl Tubing On Leads • Inhibited Oil • High Impact Strength • Internally Clamped Bushings • Radio-frequency-interference-free Bushings and Hardware • ACSR—CU Connectors • Triple-thick Tank Bottom Rim • Retained Gaskets • Patented, Automatic, Electronic Unit Testing.

Only Moloney offers all these plus features in distribution transformers

Compare . . . Then Specify Moloney Distribution Transformers

MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA

SALES OFFICES IN ALL PRINCIPAL CITIES

ME60-27

Save up to 80% of your programming costs...put solid state IBM 7070 to work for you...faster.

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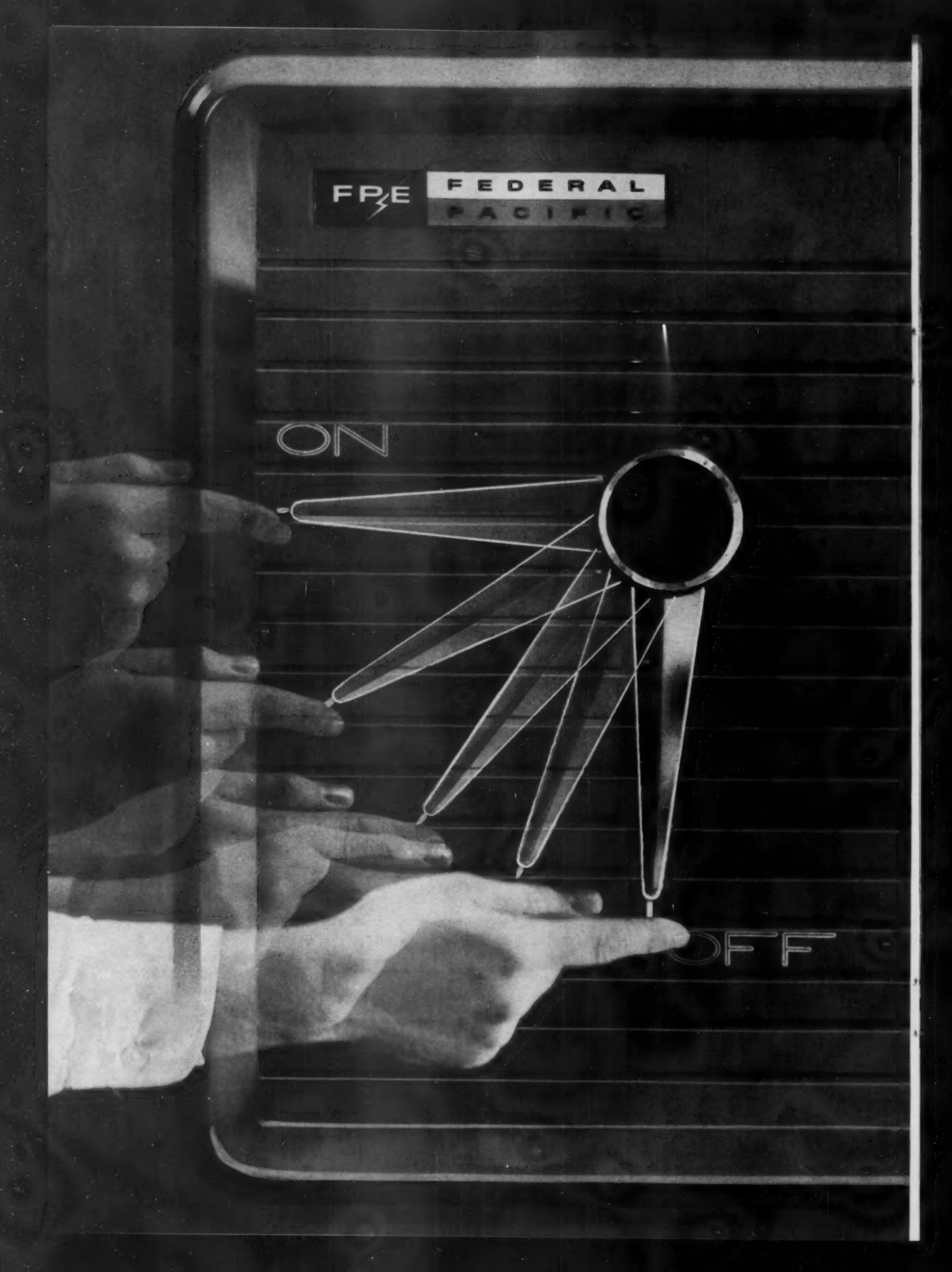
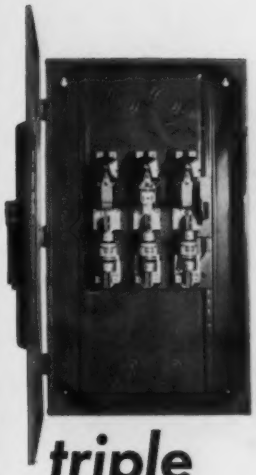

FPE
FEDERAL
PACIFIC
ON
OFF



triple safety at your fingertips!

Only the Federal Pacific type A-plus switch gives you triple protection: the complete safety of visible blades, plus the high current capacity of a circuit breaker, plus the high interrupting capacity of fuses. And at the touch of the big Rotary Handle, fingertip operation opens and closes the A-plus switch instantly—with a quick-make, quick-break mechanism that is fast . . . teaseproof . . . safe. What's more, the A-plus switch is rated for load break, not just disconnecting duty! Feature for feature, there is no switch that compares with the A-plus safety switch. Federal Pacific heavy duty industrial switches are available in ratings 30 through 1200 amperes, 250 and 600 volts, indoor and weatherproof enclosures. Write for Bulletin 1241, Dept. FP-5, Federal Pacific Electric Company, Newark 1, N. J.

FEDERAL PACIFIC ELECTRIC COMPANY

FPE

growth through creative energy

meet Reddy

His other name is Service — PG&E Service. *Reddy is tireless* — a busy bundle of energy working for you. *Reddy is an efficient worker* — in the home, in industry, on the farm. *Reddy is versatile* — handles anything from the heaviest chores to delicate electronic calculations. *Reddy is dependable and efficient* — working night and day for the most productive hourly wages anywhere.

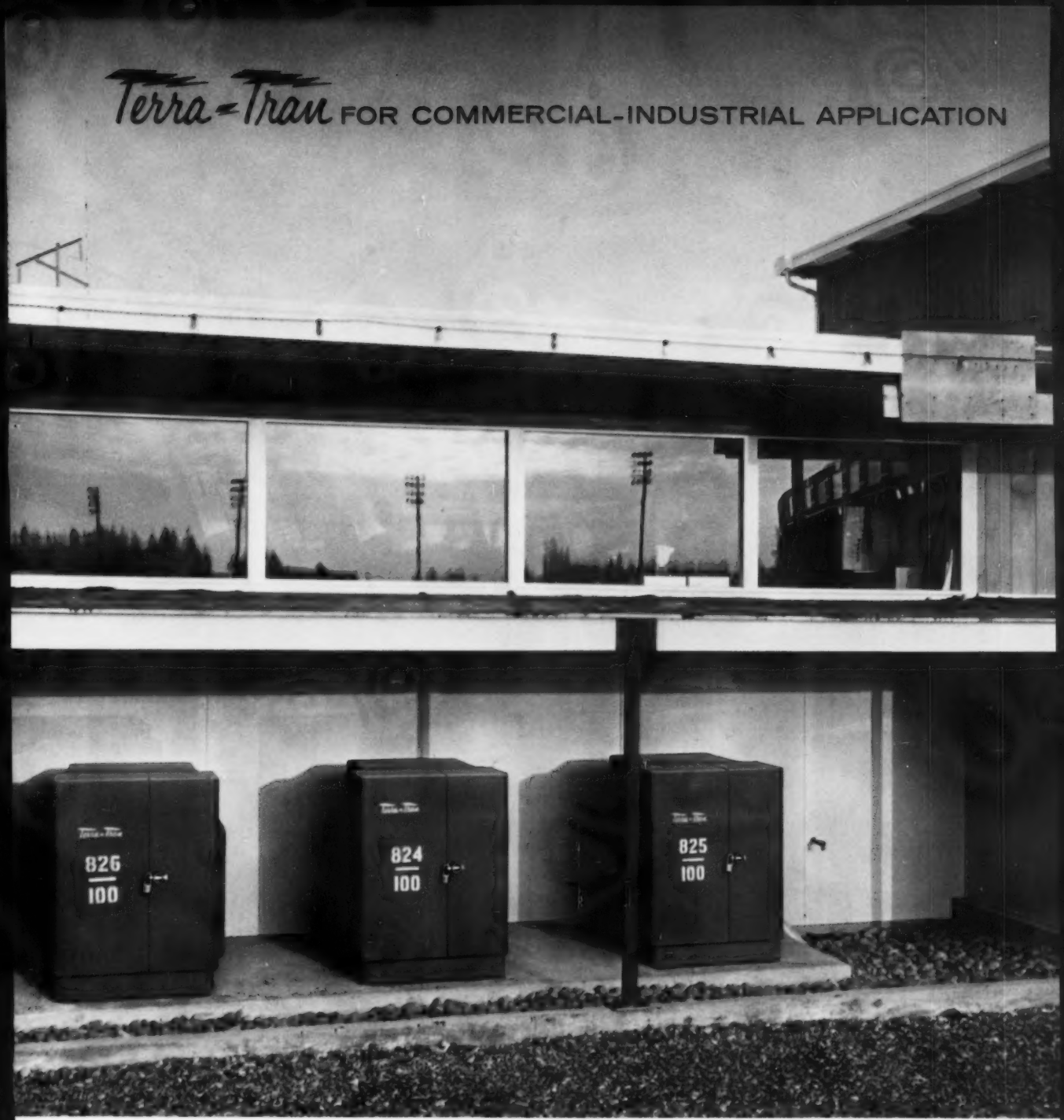
As Reddy says . . .

PG&E Service is your best bargain!

P·G and E·

Pacific Gas and Electric Company

Terra-Tran FOR COMMERCIAL-INDUSTRIAL APPLICATION



Terra-Tran provides safe, economical underground distribution for commercial-industrial users: schools, hospitals, shopping centers, airports, and industrial parks.

With Terra-Tran installed in these applications, utilities eliminate unsightly poles, platforms, and guy wires, keeping architecture, landscapes, and parking lots free and clear from distractions and hazards. Terra-Tran provides the dependable service necessary to commercial-industrial users, reducing emergency service interruptions by as much as 75%. Terra-Tran is completely safe. All high voltage parts are completely enclosed in a tamper-proof cabinet; high voltage wires are buried, eliminating overhead risks.

New installation techniques have greatly reduced the cost of bringing electrical distribution down to earth. Utilities can now Terra-Tran commercial-industrial sites at costs comparable to heavy multi pole platform installations.

Terra-Tran — pioneered and developed by RT&E — is available in a wide range of ratings . . . Single phase from 15 KVA to 167 KVA; three phase from 75 KVA to 300 KVA.

Write for Bulletin 300 for detailed information on safe and economical methods to Terra-Tran your next commercial or industrial development.

ENGINEERING TALENT CONCENTRATED ON ONE IDEA — A BETTER TRANSFORMER

RT&E CORPORATION WAUKESHA, WISCONSIN
PORTLAND, OREGON
ARLINGTON, TEXAS

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Parsons provides experienced electrical, mechanical, and structural design and construction for modern power plants, under the guidance of skilled management. For your project – large or small – it will pay you to look to Parsons for power.

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WORLD-WIDE SERVICES: POWER PLANT ENGINEERING • PETROLEUM-CHEMICAL ENGINEERING • CONSTRUCTION • ARCHITECT-ENGINEERING • ELECTRONIC SYSTEMS AND COMPONENTS • WATER DEVELOPMENT AND SYSTEMS • APPRAISALS AND ECONOMIC STUDIES • PLANT OPERATION • PERSONNEL TRAINING

REPUBLIC
RIGID STEEL
CONDUIT

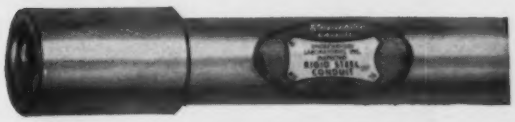
built-in quality puts a dollar in your pocket

Quality products and skilled craftsmanship go hand-in-hand to make a good looking job—and put a dollar in your pocket!

Republic ready-for-the-job *steel* conduit is easy to use, saves installation time, assures trouble-free service... because quality is built in.

Made of highest quality, soft, ductile steel, and produced by Republic's famous continuous weld process, Republic Steel Conduit pays off in lower installation costs—with uniformity, ductility, and freedom from hard spots. Clean, free-running threads. Clean inside surface. Tight, hot-dipped galvanized finish will not flake, peel, or chip off.

Craftsmanship can be fun again. If you like to make a profit, you'll like Republic Rigid Steel Conduit. Available from your electrical distributor.



GALVITE® RIGID STEEL CONDUIT (Blue Label) is a heavywall, hot-dipped galvanized conduit with a special coat of baked-on lacquer inside and out for greater corrosion-resistance and long life. **ENAMELITE®** Rigid Steel Conduit (Red Label) heavywall conduit is protected inside and out with a baked-on coating of tough, wear-resistant enamel for greater protection against moderate corrosive action.

This STEELMARK of the American Steel Industry tells you a product is made of Steel. Look for it when you buy.

Steel

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STEEL AND TUBES DIVISION • DEPT. A-1066
216 EAST 131st STREET • CLEVELAND 8, OHIO

I want to learn more about Republic Rigid Steel Conduit. Please send complete information.

Name_____ Title_____

Firm_____

Address_____

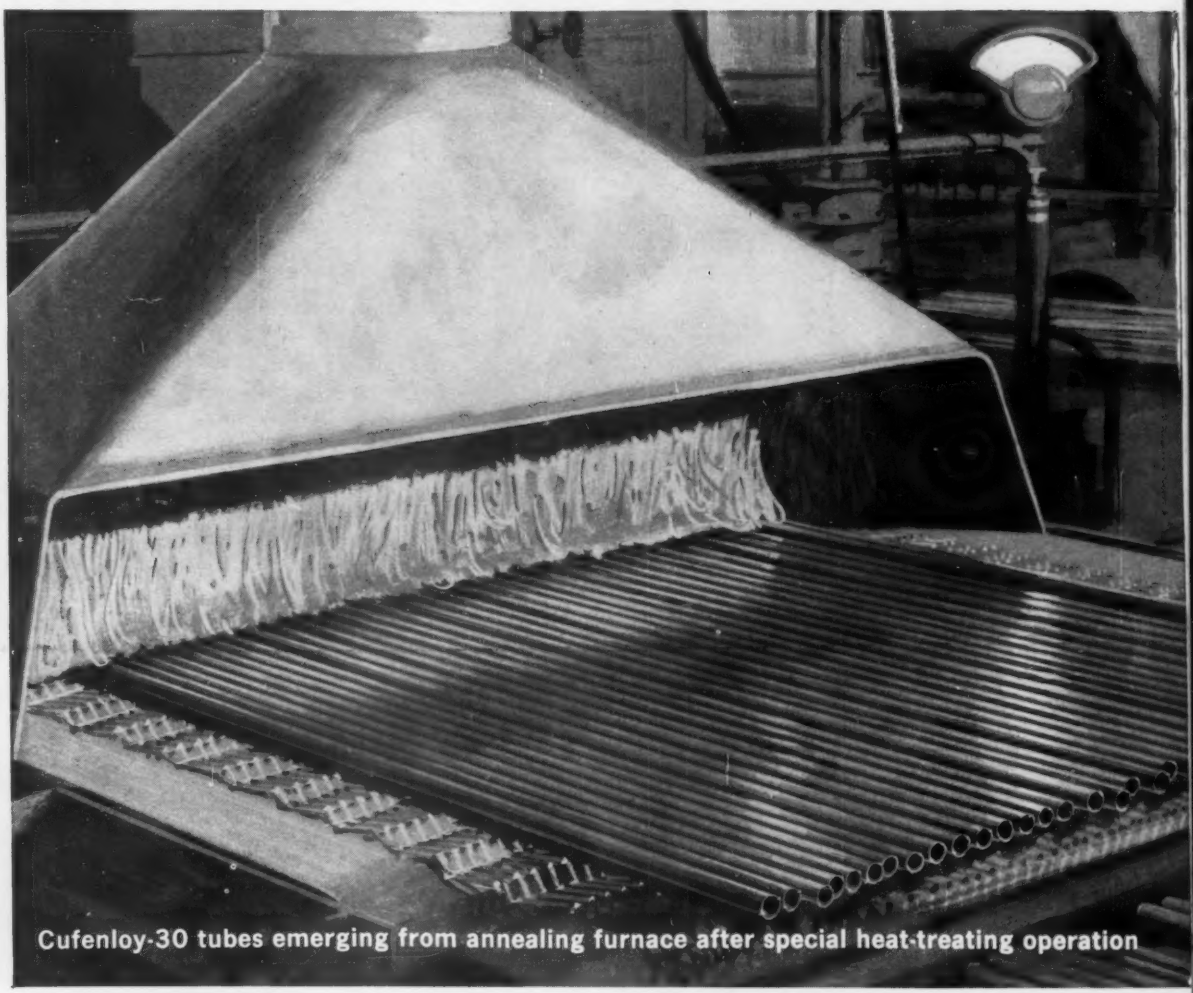
City_____ Zone_____ State_____

For phone number of closest representative see advertising index in back of book.

DEVELOPED BY PHELPS DODGE

CUFENLOY-30...DRAWN, STRESS-RELIEVED CONDENSER TUBES THAT OFFER IMPROVED PROPERTIES...CUT BUNDLE COSTS!

Approved under ASME Code for unfired pressure vessels



Cufenloy-30 tubes emerging from annealing furnace after special heat-treating operation

New, high strength Phelps Dodge Cufenloy-30 condenser and heat exchanger tubes are the result of years of intensive Phelps Dodge research devoted to improving the properties of copper base alloys.

Cufenloy-30 (copper-nickel alloy containing nominally 70% copper and 30% nickel) properties offer OEM and re-tubing users these important advantages:

1. Increased tensile and yield strength for up-to-800°F. metal temperature.

2. Thinner tube walls, when substituted for annealed cupro-nickel 30%, that reduce total tube bundle weight as much as 15% with consequent lowering of cost per bundle.

3. Cost reduction up to 50% per bundle without any sacrifice of safety when substituted for the annealed 65/35 nickel-copper alloy.

Cufenloy-30 tubes are fabricated by a special Phelps Dodge-developed drawing and heat-treating process that is unique in the industry. Test data on this improved tube was thoroughly evaluated by an independent research institute and final results submitted to The American Society of Mechanical Engineers. Under case num-

Comparison of minimum wall thickness of ⅝" O. D. tubes of various alloys when made to ASME code requirements.

Alloy	ASME Allowable Stress Values, psi At Design Temperatures 450°F	600°F	Design Pressures, psi	Minimum Wall Thickness (inches) to comply with Allowable Stress Values ⅝" O. D. Tube at 450°F	at 600°F
70/30 Copper-Nickel (Annealed)	10,100	9,600	2,000	.0574	.0600
			3,000	.0829	.0868
			4,000	.1070	.112
Cufenloy-30 Drawn, Stress-Relieved	15,400	14,600	2,000	.0386	.0408
			3,000	.0565	.0593
			4,000	.0735	.0772
65/35 Nickel-Copper (Annealed)	14,750	14,700	2,000	.0400	.0404
			3,000	.0586	.0590
			4,000	.0762	.0767

ber 1266 the ASME Boiler and Pressure Vessel Committee unanimously approved Cufenloy-30 tubes for use in ASME unfired pressure vessel code applications. Also the ASTM B-5 Committee has included the Cufenloy-30 alloy in the B-111 specification for copper alloy condenser tube.

Cufenloy-30 tubes, in drawn, stress-relieved condition, are available in all standard condenser and heat exchanger sizes, in famous Phelps Dodge uniform bore Dual Gauge and in "U" bend tubes. For further information, contact your local Phelps Dodge sales office or write Dept. EW-7 for the Cufenloy-30 technical brochure.

PHELPS DODGE COPPER PRODUCTS
CORPORATION
300 Park Avenue, New York 22, N. Y.

PD

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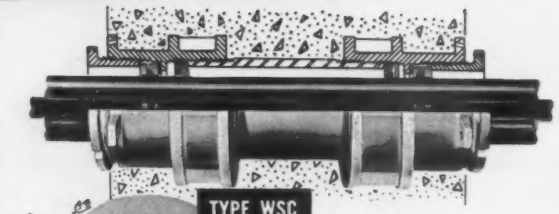
NEW! a complete line of O.Z. WATERTIGHT ENTRANCE FITTINGS

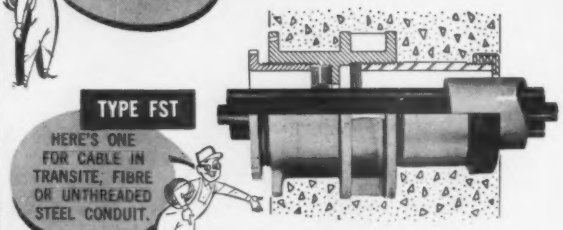
for Conduit or Cable

End leakage problems once and for all! O.Z.'s new wall and floor entrance fittings for installation in concrete provide a positively watertight seal around conduit or cable at any pass-through point! Use them with threaded or unthreaded steel conduit, fibre or Transite® conduit, or exposed cables of varying number and sizes. Gland-type sealing assemblies, with pressure bushings, may be tightened at any time. Fittings accommodate conduit ranging from ¾" to 6". Standard types, sizes available from stock. Specials made to order.



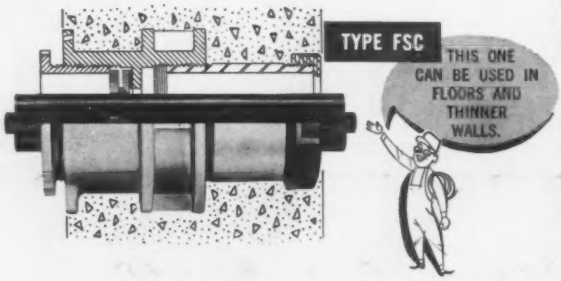
TYPE WSC

HERE'S A SEAL FOR DIRECT BURIAL CABLE.



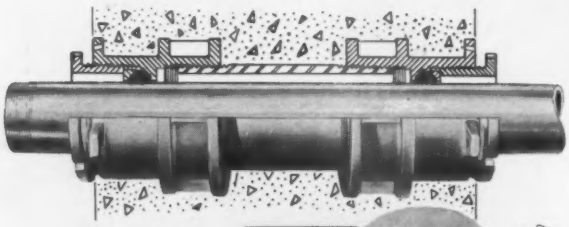
TYPE FST

HERE'S ONE FOR CABLE IN TRANSITE, FIBRE OR UNTHREADED STEEL CONDUIT.



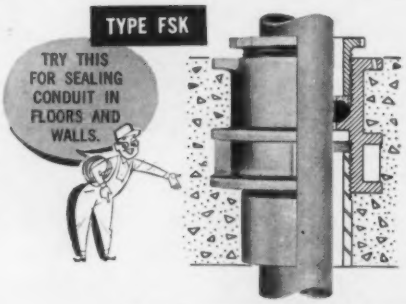
TYPE FSC

THIS ONE CAN BE USED IN FLOORS AND THINNER WALLS.



TYPE WSK

THIS ONE'S FOR CONDUIT WALL ENTRANCE SEALING.



TYPE FSK

TRY THIS FOR SEALING CONDUIT IN FLOORS AND WALLS.

For more information on fittings and other O.Z. products, call your local distributor, or write to the company.

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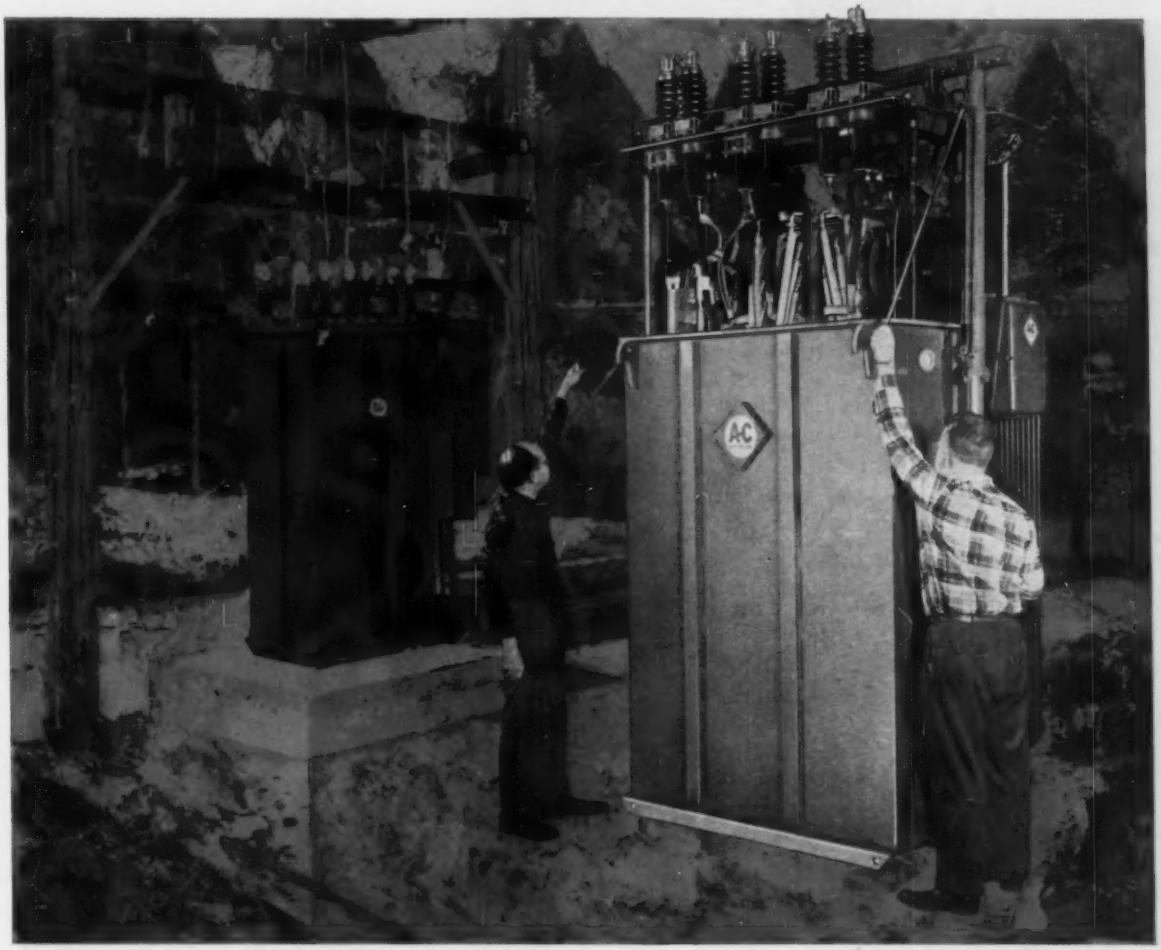
ORIGINATORS OF 5/8% STEP REGULATORS



SFR Feeder Voltage Regulator

Only exclusive unit construction delivers

extra regulator values you can see

Why is unit construction so important to regulator users? Simply because this design is *basic* to these many other extra-value A-C features *you can see*...advantages you can't find on any ordinary regulator!

You'll see continuous leads passing directly from the coils to the double-bolt terminals on the dial switch.

You'll see 78 fewer bolted connections only unit construction can offer. No leads to disconnect, no terminals to remove when you untank.

You'll see better workmanship, since all connections are securely made and double-checked *before* unit is tanked!

You'll see how much easier inspections can be. To untank, remove cover bolts and control compartment retaining nuts. Then lift entire assembly from the tank... there's no need to remove oil.

Your nearby A-C office has the facts on single and three-phase sizes from 2,400 to 69,000 volts... in ratings up to 2,500 kva. Or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

A-1379

Caliband is an Allis-Chalmers trademark.

CALIBAND control — At the twist of the control knob, you can set or test voltage level and band width without changing voltage or interrupting regulated service.

For phone number of closest representative see advertising index in back of book.

how good should power cable be

...*for dielectric strength?*

At CIRCLE, the point is not how well specifications are met—but rather *how far they can be exceeded!* Take, for example, the well-known "double voltage test" as required by IPCEA-NEMA.

IPCEA-NEMA Performance Requirements

"6.5.3 After the sample has been immersed for at least one hour, it shall withstand for 5 minutes a test voltage which is twice the test voltage given in Table 12."

"6.5.4 . . . starting with the voltage at which the test described in 6.5.3 was made, the voltage shall be raised in steps of approximately 20 per cent of the immediately preceding voltage until failure occurs, the voltage to be kept constant at each step for 5 mintues."

"Circlesheath® Type RR Power Cable Performance"

The following table describes the performance of three samples of Circle butyl-insulated Type RR power cable.

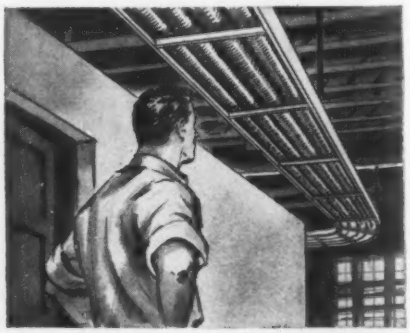
CABLE SIZE	RATED VOLTAGE	DOUBLE AC TEST VOLTAGE	CIRCLE B'KDN VOLTAGE	MAXIMUM STRESS IN VOLTS PER MIL
2 AWG	5KV	28KV	48.3KV	454
1/0 AWG	5KV	28KV	40.3KV	356
500 MCM	5KV	31KV	44.6KV	307

Circle CIRCLOC® Interlocked Armored Cable combines flexibility with mechanical protection in one lightweight, economical construction. It trains easily over obstructions; is ideal for future plant expansion. Available in galvanized steel, bronze or aluminum armor—from 600 to 15,000 volts.

A Circle power cable, subjected *for over two years* to a 250% overload of rated voltage in a *test still in process,* continues to meet all specified requirements.

Turning out high-reliability power cable requires expert knowledge of compounds, absolute quality control—and men who *know enough* to produce the very best. Next time you specify power cable, ask for Circle—there's no finer made.

CIRCLE WIRE & CABLE CORP., Maspeth, N. Y.



CIRCLE WIRE & CABLE
a subsidiary of
CERRO DE PASCO CORPORATION

RUBBER COVERED WIRE & CABLE • VARNISHED CAMBRIC CABLE •
PLASTIC INSULATED CABLE • NEOPRENE SHEATHED CABLE • CIRTUBE® EMT

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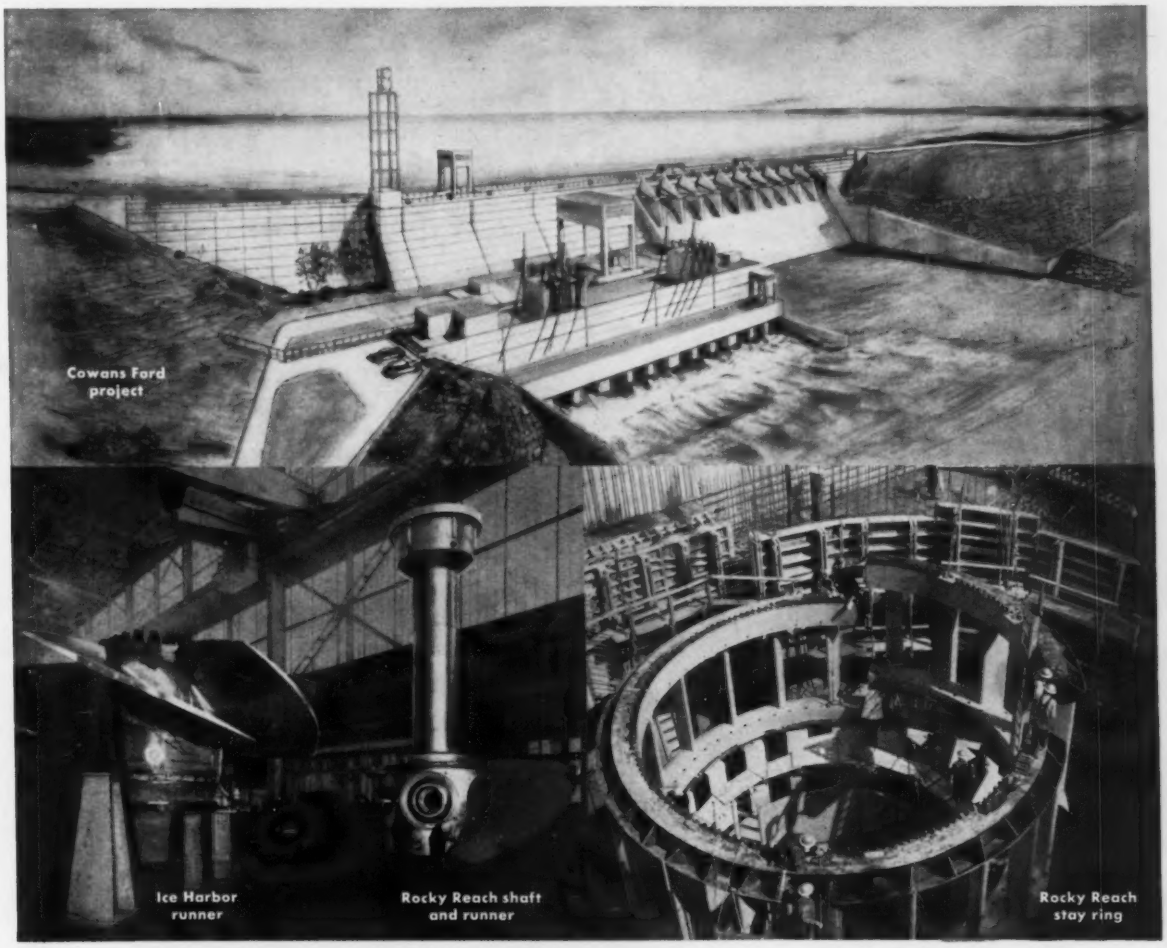
ALLIS-CHALMERS



high-head Kaplans for peaking

—previous record-breakers also by Allis-Chalmers

Cowans Ford is the outstanding illustration of Kaplan turbines used to provide peaking capacity. Duke Power Company, with Chas. T. Main Inc. as consulting engineers, has selected A-C Kaplan turbines for operation at 115-ft. head. Each of the three units is guaranteed to provide a maximum of 153,000 hp. Actual operation will involve only a short time each day, meeting peaking requirements of the system which is predominantly steam. The resulting average load factor, *less than 5%*.

KAPLAN RECORD-BREAKERS

Cowans Ford—the third in a series of outstanding A-C Kaplan turbine installations. These units exceed those at both Ice Harbor and Rocky Reach in rated capacity and head. All are similar in construction (those at Cowans Ford are slightly smaller in physical size). Allis-Chalmers diversified experience to date includes over 240 Kaplan turbines — *a record 6 million hp.*

Rocky Reach—public utility district supplied with seven Kaplan turbines, each 140,000 hp (under 92-ft. head).

Ice Harbor — Corps of Engineers installation recently provided with three new A-C Kaplans for operation at 89-ft. head. These held the record with 143,000 hp per turbine until Cowans Ford.

In every facet of hydro generation, people count on record performance and experience from Allis-Chalmers. For assistance anytime, contact your local A-C representative or write to **Allis-Chalmers,** Hydraulic Division, York, Pa.

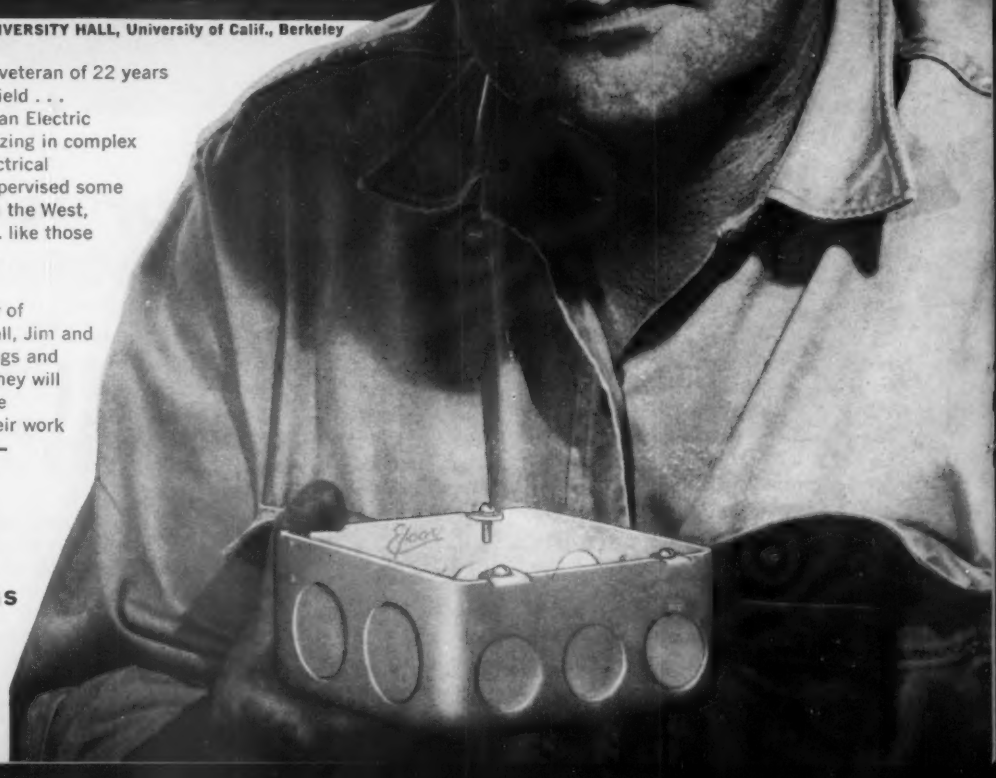
A-1383

The men who really know...know Efcor

UNIVERSITY HALL, University of Calif., Berkeley

Meet Jim Mahaney, seasoned veteran of 22 years in the electrical construction field . . . superintendent for the Coopman Electric Company; contractors specializing in complex commercial and industrial electrical installations. Jim, who has supervised some of the most interesting jobs in the West, insists on quality products . . . like those manufactured by Efcor, for a trouble free job.

For instance, in the University of California's new University Hall, Jim and his men have used Efcor fittings and boxes in an installation that they will be proud of for years. Men like Jim Mahaney take pride in their work **. . . the men who really know— know Efcor.**



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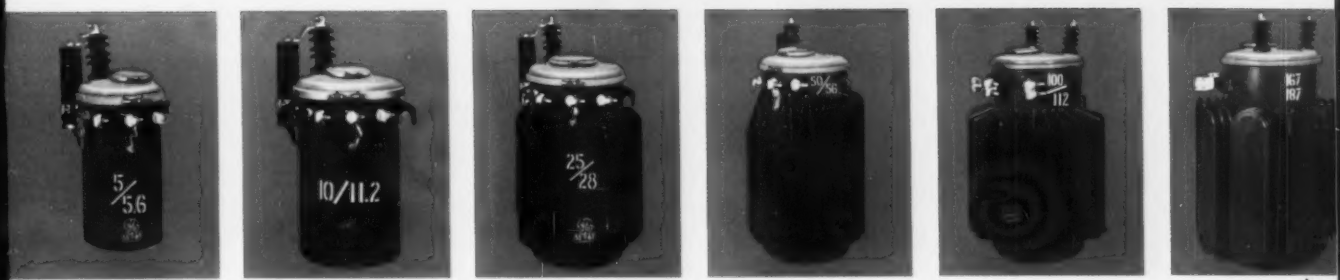
ELECTRICAL FITTINGS CORPORATION

WOODSIDE 77, NEW YORK

GENERAL ELECTRIC LOWERS DISTRIBUTION TRANSFORMER OWNING COSTS WITH PREFERRED KVA RATINGS



GENERAL ELECTRIC

PREFERRED-KVA RATINGS OFFER . . .

5 ways to lower distribution transformer owning costs

Another significant step toward lower distribution transformer investment and operating costs

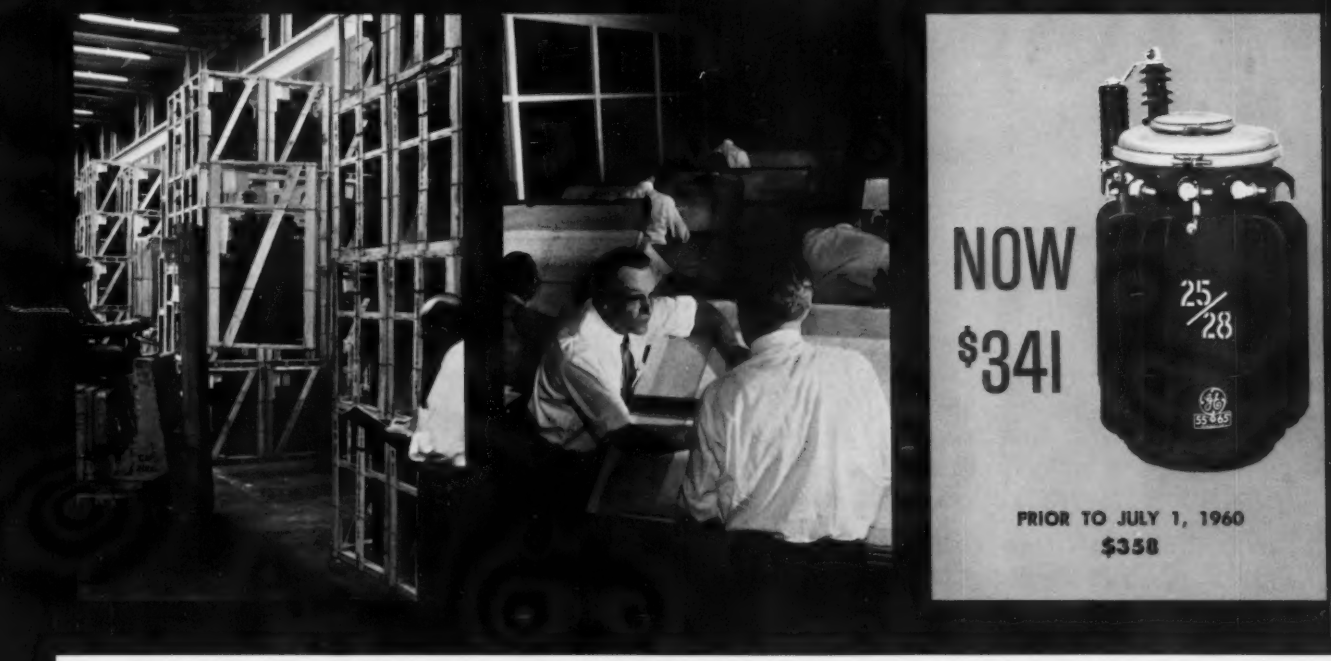
Lower Changeout Cost Use of preferred-kva ratings can lower changeout costs since more load growth can be absorbed. Based on a changeout practice of 150 percent of rating and an annual load growth of six percent, transformer replacement occurs on the average of every 7½ years. With preferred kva ratings, changeout would occur every 12 years, extending the transformer life-on-the-pole 4½ years.

Lower Operating Costs Distribution system operating costs can be lowered by using standard preferred-kva ratings. When preferred-kva ratings are used, the average transformer load is less, lowering total losses. Lower copper losses more than compensate for increased core losses. Also since voltage regulation is related to copper loss, use of General Electric's preferred-kva ratings also means better voltage regulation.

General Electric's preferred-kva distribution transformer program offers you five important ways to lower your total owning costs of distribution transformers. The preferred-kva concept is based on an extensive survey made among representative utilities across the country. The majority of those interviewed preferred standardizing on these 55° ● 65° transformer ratings: 5/5.6, 10/11.2, 25/28, 50/56, 100/112, and 167/187 kva.

By standardizing on these preferred-kva transformer ratings from General Electric, you can own the highest quality transformers at lower total owning cost than ever before possible.

Before you buy another transformer, let your G.E. Sales Engineer show you how you can lower your distribution transformer owning costs with preferred-kva ratings from General Electric.



Lower Inventory Cost You can reduce your transformer inventory costs by standardizing on preferred-kva ratings. For example, if present maximum stock requirements are 20 15-kva units and 35 25-kva units, a total stock of 55 transformers is required. Standardizing solely on the 25-kva rating, total stock could be lowered to 44 units because of the diversity of need.

Simplified Procedures Standardizing on preferred-kva distribution transformer ratings lowers the cost of such overhead items as ordering, record keeping and financial procedures. Simplifying these procedures plus simplification of transformer application methods helps lower your total owning cost of General Electric distribution transformers even further.

Lower Initial Price In addition to the other factors which contribute to lower distribution transformer owning costs, General Electric recently lowered the initial price of preferred-kva transformers as much as five percent.

This action was taken to reflect manufacturing cost savings which result when utilities support this program by volume purchases of fewer kva ratings.

Progress Is Our Most Important Product

GENERAL ELECTRIC

CUT INITIAL COST AS MUCH AS 40¢ PER SQ FT

It's easy with the most powerful fluorescent on the market! If you're planning a new building . . . or remodeling an existing one . . . you can shave your customer's initial lighting investment by as much as 40¢ a square foot!

How? Specify G-E Power Groove* Lamps. They give more light than any other lamp. You use fewer lamps, fewer fixtures, fewer everything else it takes to light your customer's building properly. And his savings keep mounting. With fewer lamps, fixtures and ballasts, his maintenance bills will be lower, too.

The secret's in the grooves. They're what bend the arc stream (it's straight in other fluorescents) . . . lengthen it . . . make the lamp put out more light. Only G-E Power Groove Lamps have 'em. Only General Electric gives you this years-ahead light source—another example of a difference that makes a difference in value to you. Call your G-E Lamp distributor for more information. General Electric Company, Large Lamp Dept. C-031, Nela Park, Cleveland 12, O.

*General Electric's trademark for configurated fluorescent lamps

Progress Is Our Most Important Product

GENERAL ELECTRIC

For phone number of closest representative see advertising index in back of book.

LET'S TALK FUSE LINKS

■ Outwardly most fuse links look very much alike . . . but there the similarity ends! What, then, makes Kearney Fuse Links more dependable . . . more accurate than others? ■ Let's start with construction. All Kearney Fuse Links feature LOW temperature fusible elements and de-ionizing fibre lined tubes. Temperatures inside fuse tube and cutout cartridge always remain well below the fibre charring point . . . even after prolonged service overloads. Thus, the all-important fibre is not impaired by excessive heat . . . fuse tube and cartridge retain their original strength and arc-quenching capabilities necessary for positive full-range fault interruption ■ The exclusive de-ionizing fibre lining and extra strength of the Kearney fuse tube, in effect, make the Kearney Fuse Link a cutout within a cutout when interrupting fault currents up to 600 amperes.* Extra-long, tough, moisture and weather resistant tube provides a longer de-ionization path to clear low faults faster, more positively . . . will not warp or hang up in cartridge. Fuse tube and top terminal are securely joined to prevent loss of expulsion gas pressure ■ Select components, rigid quality control, exhaustive laboratory and substation testing guarantee strict adherence of Kearney Fuse Links to published T-C curves. For positive system protection and accurate co-ordination . . . specify Kearney Fuse Links . . . Standard or Specialized.

*An average figure varying with different fuse ratings.

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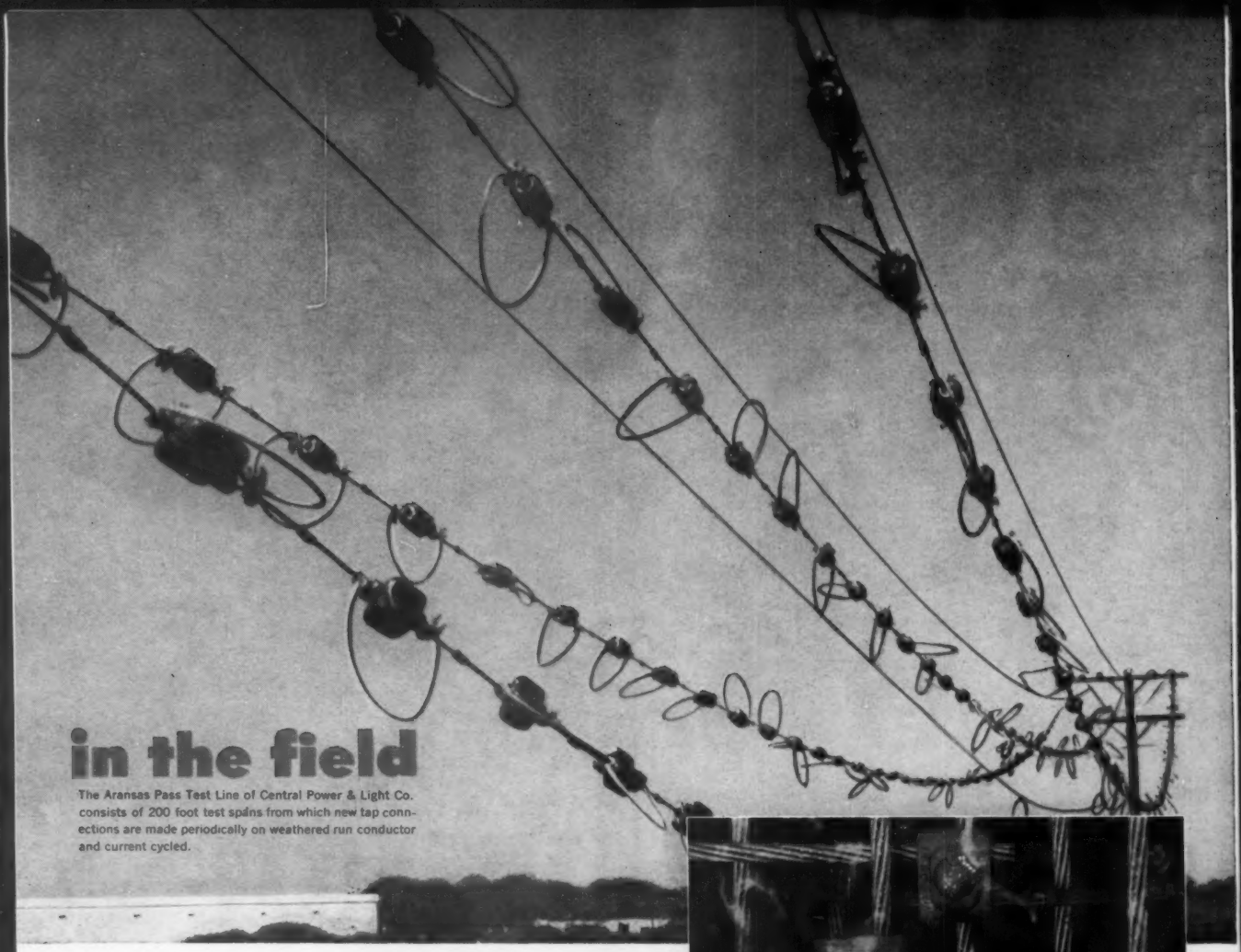
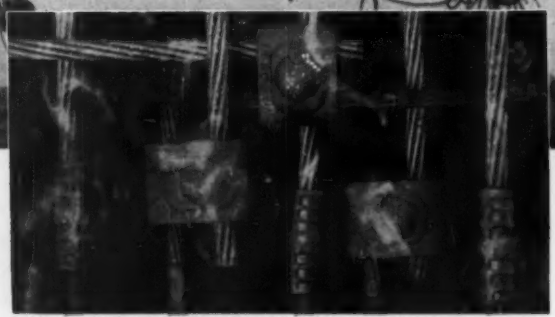


in the field

The Aransas Pass Test Line of Central Power & Light Co. consists of 200 foot test spans from which new tap connections are made periodically on weathered run conductor and current cycled.

...and in the lab



Inside view of a Burndy Salt Spray Corrosion Test shows what happens to connectors and cables of dissimilar metals when exposed to severe atmospheric conditions.

BURNDY RESEARCH

CONCENTRATES ON THE DEVELOPMENT OF BETTER ELECTRICAL CONNECTIONS

Burndy's field research with Central Power & Light on weathered overhead lines is expected to provide valuable information on connector installation practices, and possible data for the future design of connectors and cables with longer and more predictable life spans.

Burndy's research has produced: Massive Aluminum Tap—TAPIT®; Single Sleeve ACSR Splice—UNISPLICE™; Pre-insulated Service Entrance Splice—INSULINK®. Burndy research will continue to concentrate on the development of better electrical connections.

BURNDY

58-18

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EW

$2 Million Line Planned

Public Service Co. of Colorado announced it will begin construction next spring of a $2 million, 70-mile power transmission line from near Grand Junction to Montrose on Colorado's western slope.

The 115,000-v line is part of a long-range plan for interconnecting all electric utility systems in Colorado. PSC said the line is an important segment in its proposed transmission system to integrate generating units of Curecanti and other major units of the Colorado River Storage Project.

The line will extend from the company's Cameo steam electric station, 14 miles east of Grand Junction on the Colorado River, to Montrose and connect with the transmission system of Western Colorado Power Co. at Montrose.

PSC said interconnection of the two systems will permit the two companies to exchange power and improve reliability in emergencies.

Western Colorado Power, a subsidiary of Utah Power & Light Co., is the only utility system in Colorado not interconnected with steam electric and hydroelectric facilities of the Colorado, Rocky Mountain or Pacific Northwest power pools.

Calectric Sells Mexican Properties

Comision Federal de Electridad, an instrumentality of the Mexican government, has purchased all the capital stock of Industrial Electrica Mexicana, S. A. de C. V., from California Electric Power Co.

Purchase price for the stock was $5.6 million, payable over a period of time. The indebtedness is evidenced by 10 promissory notes executed by Nacional Financiera, one of which is payable each April 1, beginning in 1961. The notes bear 6% interest.

The transaction was concluded Aug. 31. The price received is approximately equal to the book value of the property involved.

Power supply to Industrial Electrica Mexicana will continue from the United States by Calectric for some 28 to 30 months. After that it is expected that Comision Federal de Electridad will have its own power supply available from a plant now being built in Mexico.

Carl C. Ernst, president of Calectric, said of the sale, "Over a long period of years we have built up a very sound and excellent distribution company serving parts of northern Baja California around the Mexicali Valley and northwest Sonora in Mexico. The system was making a satisfactory return and we were looking forward to continued growth and development in that area.

"However, the announcement on the part of the Mexican government of their policy to nationalize the power industry, followed by their awarding of a contract to build power-generating facilities to supply the power needs of the IEM service area, caused us to re-examine our investment position in Mexico and led to our decision to sell."

► **A 20-year power contract** between the Bonneville Power Administration and Harvey Aluminum Inc. paves the way for the establishment of a new two-potline aluminum reduction plant by the aluminum company. The contract calls for sale of 75,000 kw of firm and 75,000 kw of secondary power. Several similar contracts will be signed in the near future, bringing a total of $145 million worth of new industrial facilities to the Northwest.

► **California-Oregon Power Co.** has been granted permission by the Oregon Public Utilities Commission to increase its gross revenue by $1,013,000—a 9% boost. The increase will give Copco a 5.51% return on investment.

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New Melones Recommended

As a result of joint studies, the Army Corps of Engineers and the Bureau of Reclamation have recommended, on a regional level, a $114 million water and power project at New Melones on the Stanislaus River in California.

In a unique arrangement, it is proposed the Corps of Engineers build the dam and that the irrigation and power features be operated by the Reclamation Bureau in coordination with existing Central Valley project features.

The 1944 Flood Control Act authorizes construction of New Melones as a 450,000 acre-ft capacity storage reservoir with no power facilities. The new studies indicate, according to a joint Army-Bureau report, that the reservoir should be of 2.4 million acre-ft capacity and that a 150,000-kw power plant should be constructed.

Bridge River Amended

The Los Angeles Department of Water & Power has filed an amended application with the FPC covering its proposed Bridge Canyon development. The new proposal increases the plant capacity to 1.2 million kw and decreases the cost from $243 million to $204 million.

A consolidated hearing on the conflicting applications of the department and the Arizona Power Authority has been set for Feb. 6.

Longest 345-Kv Line

Arizona Public Service Co.'s President Walter Lucking has announced that his company expects to begin construction early next year on the longest 345,000-v transmission line in the United States. The line will connect the company's proposed Four Corners plant with load centers in Arizona. Two lines will go from the Four Corners generating plant to the Cholla power plant, now under construction near Joseph City, Ariz. From Cholla, a single line will then connect with the Phoenix area. Total cost of the lines and switching stations—$46 million.

B. C. Power Developments

B. C. Electric Co.'s President A. E. Grauer stated that a stronger case exists for export of surplus B. C. electric power than for natural gas. Natural gas is not replenishable, but hydro is. Grauer commented that power exports to the U. S. would be an economic boon to the province saying that "if agreement could be reached on an export program, benefits for Canada would be terrific. There is no reason why during the period before nuclear plants become competitive, United States would not buy our surplus hydro on term contracts, subject to our recapturing it at the end of the term, because the alternative is higher cost steam power."

In Victoria, Dr. Keenleyside, chairman of B. C. Hydro, the government agency designated to construct the Columbia River project, said the first step will be for applications for title to portions of the river involved and then a water license. He said that engineers are now working on details of the development. B. C. Hydro's plans include dams at Arrow Lakes and Mica Creek at a total cost of about $300 million. Public hearings on these plans will be held in November. Keenleyside said, "We are gearing things so there will be no delay."

Victoria sources say that this is the first concrete progress report in Ottawa and there will be as little delay as possible in calling meetings here because all objections to schemes must be heard by B. C. Water Comptroller Arthur Paget before he can issue a license allowing use of the river. Canada cannot legally enter into a binding treaty with the U. S. until this license is issued.

► **California-Pacific Utilities Co.** has moved into new offices at 550 California St. in San Francisco. Among staff additions announced recently by this company are the employment of **Sam V. Kaser** as district engineer and operating supervisor, replacing **Warren Hallum** at John Day-Burns. Hallum was transferred to the La Grande district. **C. S. Rasmussen** has joined the company as Baker district engineer.

► **Douglas County PUD** has retained a firm of New York bond attorneys to assist in negotiating power contracts for the sale of energy from the proposed Wells Dam. Power from the project must be allocated by Jan. 31, 1961, under an agreement with Puget Sound Power & Light, which has been financing a large part of the engineering work on the project.

► **Utah Power & Light Co.** will cut its rates in the Vernal area by more than $90,000 a year on completion of its new high-voltage line to the Uintah Basin.

City Renews Negotiations For Private System

The City of Springfield, Ore., which operates a municipal electric system in competition with Pacific Power & Light Co., has renewed negotiations toward a bond issue election to purchase the PP&L facilities.

An election to authorize a $3.5 million bond issue for purchase of the company properties failed narrowly on Nov. 4, 1958.

Pacific Power has reiterated its previous position that its properties are not for sale but, in view of Springfield's power of eminent domain, will agree to a stipulated price based on an agreed value of $2,850,000 as of Aug. 25, 1958, plus gross additions and less gross retirements and less transfers out of the area. Total price is not to exceed $3.1 million.

Pacific Power's President D. R. McClung, in answering the proposal of Springfield Mayor Edward C. Harms, said:

"We have stated on many occasions before and we state again that the wasteful duplication of facilities resulting from indiscriminate competition as it has developed in Springfield is not in the public interest, and should be ended. The acquisition of our properties by the city would be one way of resolving the situation. If the voters do not approve the proposed bond issue, we hope that they may then be given the opportunity of deciding whether our company should purchase the municipal system."

► **Seattle City Light** is seriously considering a plan that would offer underground residential wiring for as low as $250 a lot in new areas and $5 a front-foot in built up areas, according to Paul Raver, superintendent. The $250 fee would apply to residential developments of at least eight lots while the $5 charge would apply to Local Improvement Districts or Road Improvement Districts comprising an area of at least eight square blocks, where the lines are less than 100 ft long. Trenching and backfilling would be required by the property owner.

Thurston PUD Bonds Floated

The Thurston County PUD commissioners, at Olympia, Wash., in the proposal to take over the properties of Puget Sound Power & Light within Thurston County, voted to float an $11.5 million bond issue to finance the project, and filed condemnation proceedings in Thurston County Superior Court.

The action was taken just two days after the commissioners had approved a tax levy to raise $100,000 to pay for a study of the feasibility of acquiring the Puget Sound facilities.

Adoption of the new $100,000 PUD budget was over the protests of the Thurston County Taxpayers Assn., who proposed to ask the next legislature to pass a law requiring all PUDs to submit proposed tax measures to a vote of the people.

Duplication Legislation Proposed

Oregon Public Utilities Commissioner Jonel C. Hill will offer the 1961 Oregon Legislature legislation that would prevent future duplications of electric service and offer a vehicle to solve problems of duplication wherever they may exist.

Hill hailed the Sept. 15 vote of people of Tillamook County approving a $4.4 million bond issue to permit purchase by the Tillamook PUD of Pacific Power & Light Co. distribution facilities in the county as "recognition of the evils of duplication of electric power facilities."

Present duplications in eight Oregon counties chiefly involve private utilities and PUDs, cooperatives or small municipals.

Hill said Oregon now has "no workable certificate of convenience statute . . . relative to electric power utilities."

► Asetin County, Wash., residents will vote in the Nov. 8 election on a **proposal to form a public utility district** in the county and take over the water and electric distribution services now operated by Washington Water Power Co. Two previous elections in Asetin County have voted down PUD proposals.

► The Washington State Supreme Court has ruled that the **owners of utility lines adjacent to airports bear a partial responsibility for safety of aircraft** using the field. The prime responsibility rests with the airport operators but passes to the utility if the airport operator fails to act, the court held in a suit brought against the Orcas Power & Light Co. and the Inter-Island Telephone Co.

Priest Rapids Contractor Indicted

Merritt-Chapman & Scott, New York, contractor, was indicted Sept. 15 by a Grant County, Wash., grand jury on nine counts of bribery in connection with the Priest Rapids project.

The firm was accused in the indictment of bribery in connection with gifts totaling more than $6,590 which the indictment said went to Glenn A. Smothers, former manager of the Grant County PUD, which is financing the 788,500-kw project. Merritt-Chapman & Scott is building the dam under a $98 million contract with the PUD.

It was the second indictment returned by the Grant County grand jury since it began a probe of public utility district affairs two years ago. The other indictment, returned last spring, led to the conviction of a Ephrata, Wash., business man and adviser to the PUD, Frank T. Bell. He was convicted of first degree perjury in his testimony before the grand jury.

E. B. Gibbens, the current manager of the PUD, said payments to the firm on controversial "extra-work orders" have been stopped after reaching almost $900,000 of the $1 million total. He said that the PUD attorney, Darrel E. Ries, has held that the noncompetitive work orders are illegal.

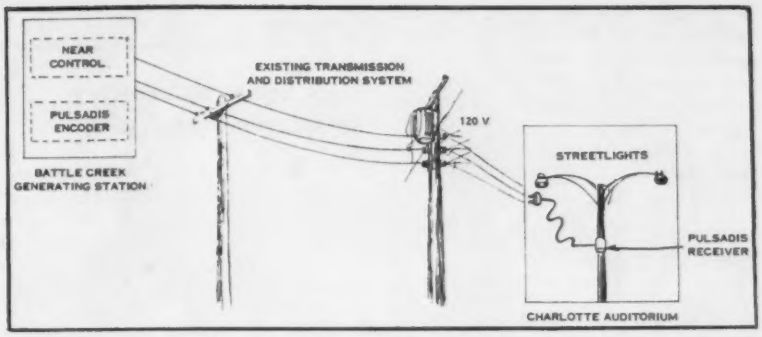
Smothers resigned from the PUD post two years ago after a controversy over the $1 million in extra work which PUD attorneys held had been awarded Merritt-Chapman & Scott improperly through noncompetitive work orders.

Round Butte Authorized

The FPC authorization of Portland General Electric's $72 million Round Butte hydroelectric project on the Deschutes River in Oregon Sept. 12 left PGE waiting only licensing by the Oregon State Water Resources Board before proceeding to construction.

PGE is hopeful of gaining a state hydroelectric license for the 440-ft-high rockfill structure to ease still existing tensions that grew out of its construction of the Pelton project, seven miles downstream from the Round Butte site. The State of Oregon has never licensed the Pelton project, but PGE constructed it notwithstanding under a U. S. Supreme Court decision, which held that state water laws need not apply to projects touching on federal reservations. Like Pelton, one abutment of the Round Butte project will rest on the Warm Springs Indian Reservation.

The Round Butte project, with name-plate rating of 247,050 kw, would be the largest hydroelectric project completely within Oregon's boundaries. Situated in a 1,000-ft-deep canyon, the 440-ft rockfill structure requiring more than 8,000,000 yd of fill material would impound water in three river canyons. The site is only a short distance downstream from confluence of the Deschutes with the Crooked and Metolius Rivers. The reservoir would reach six miles up the Crooked, eight miles up the Deschutes and 11 miles up the Metolius.



Schematic Representation of Coded Receiver Systems

► Two PUDS in southwest Washington have authorized rate reductions. **Grays Harbor PUD** will reduce rates 3½%, effective Jan. 1. **Wahkiakum County PUD** will also lower rates, saving their users an annual $6,000.

► **The Tacoma Utility Board** has refused to reconsider its decision o increase the street lighting charges that are paid by the city's general fund. The increase will double the cost of power from three to six mills.

► A jurisdictional dispute at **Westinghouse Electric's** Sunnyvale, Calif., plant was resolved by a close vote favoring the incumbent International Brotherhood of Electrical Workers, AFL-CIO. The vote, conducted by NLRB, was 174 to 142 in favor of IBEW and against installation of United Electrical, Radio and Machine Workers of America, UE, as bargaining agent for some 350 electrical workers.

► **A federal court has overruled the Revenue Service** and ordered a tax refund of $1,575,000 to Portland General Electric Co. The judge said that the utility had the right to base useful life of certain properties on company experience.

Emergency Alarm Demonstrated

The first public demonstration of the National Emergency Alarm Repeater (NEAR) System was held on Oct. 11.

This demonstration showed how homes, factories, farms, offices and other points could be warned automatically of enemy attack or major disaster through the NEAR device, plugged into an electric socket. Thus, the power system could become the modern counterpart of Paul Revere's ride alerting people to danger.

The equipment consists of a coding device which actuates the NEAR generators and a coded receiver known as the Pulsadis Relay. The special 240-cycle coded signal was sent over the 60-cycle power lines of the Consumers Power Co. The signal was generated at Battle Creek, Mich., and was transmitted 28 miles to Charlotte, Mich., where it activated the receiver to turn on street lights which had been installed in the Charlotte High School auditorium.

The equipment was demonstrated by the Sangamo Electric Co. through the cooperation of the Office of Civil and Defense Mobilization.

► **Production of electric energy** for the Paducah Gaseous Diffusion Plant at Paducah, Ky., requires one carload of coal every four minutes or 800 tons an hour. Paducah is presently consuming four times more electric power than the rest of the State of Kentucky combined.

► **The case of the dissenting Portland General Electric Co. stockholders** who have opposed the building of the company's $72 million Round Butte Dam has been thrown out of Multnomah County Circuit Court. Despite the complaints, the Oregon Water Resources Board has recommended granting the preliminary permit on the project.

► **Electric utilities** spent over $30 million in the three-month period ending June 30, 1960, on civilian reactor projects under construction or design; bringing the total costs incurred to that date to $210 million. AEC estimates that $232 million additional will be incurred in completing these projects.

Financial Briefs

► FPC has approved the **Pacific Power & Light** bid to issue $20 million principal amount of first mortgage bonds, due 1960. PP&L will accept the joint bid of Blyth & Co. and White, Weld & Co. to purchase the bonds for the price of 99.72% of principal amount, with an interest rate of 5⅛% per year.

► **Utah Power & Light Co.** directors accepted bids at competitive bidding for 400,000 shares of $25 par preferred stock and $16 million in first mortgage bonds. The bond and stock offerings brought the company $26,296,000. Proceeds from the sale will be used to pay off short-term bank loans and to carry forward the company's expansion program.

► **A report prepared by the FPC** shows that 92% of the major privately owned electric utilities in the United States were using the straight-line method of depreciation in their accounting at the end of 1958, indicating a continuation of the trend toward its general adoption.

► **Pacific Power & Light Co. has** asked the Wyoming PSC for approval to issue and sell 27,736 shares of common stock under an employees' stock purchase program. The stock would be sold to the company's workers at 95% of the average price quoted on the open market for a month preceding the purchase.

► **Idaho Power Co.** has filed an application with the FPC seeking authority to issue and sell $15 million principal amount of first mortgage bonds and up to 100,000 shares of common stock, par value $10 per share.

► Blyth & Co. Inc., White, Weld & Co. and Shields & Co. are joint managers of a group offering $30 million **San Diego Gas & Electric Co.** 4⅝% first mortgage bonds, series H, due 1990, priced at 100%. The group was awarded the issue at competitive sale on a bid of 93.33% for the 4⅝% coupon.

Growth

Work Begins on Lower Monumental Next Spring

Initial construction work on Lower Monumental Dam on the Snake River, near Ayer, Wash., will start in the spring of 1961, according to Col. Paul H. Symbol, Walla Walla district engineer for the Corps of Engineers.

First construction money for the project was included in the public works appropriation bill signed by the President. The $152 million multipurpose project will be the second in a series of four dams planned for the Lower Snake River that will provide navigation between Pasco, Wash., and Lewiston, Idaho. Col. Symbol also said planning work would be started on Little Goose Dam, to be built on the Snake near Central Ferry, Wash. Planning funds were provided in the bill for this project.

Bridge No. 2 on Line

B. C. Electric's largest power generating station has been placed in service officially to climax a 14-year construction program in the Bridge River area.

Completion of the 264,000-kw Bridge No. 2 project brings the total developed power potential in the Bridge River area to more than 510,000 kw, nearly half the total generating capacity serving B. C.'s lower mainland and southern Vancouver Island.

Since full-scale development of the Bridge River began in 1946, two massive earthfill dams have been erected to store the stream's flood waters for year-round use.

Spring Creek Power Plant Bid

Scheumann & Johnson of Seattle, Wash., has submitted low bid of $4,126,456 for the 150,000-kw Spring Creek power plant, a unit of the Central Valley Project's Trinity River Division.

Second low bidder was Winston Bros., Green Construction Co. and Johnson, Drake & Piper of Minneapolis, a joint venture, at $4,240,061 and the third low bidder was Guy F. Atkinson Co., South San Francisco, at $4,322,080. The government estimate was $4,467,770. There were seven bids.

The power plant is scheduled for completion in the fall of 1962. Power will be generated by two 100,575-hp turbines. Water for the power will flow from Whiskeytown reservoir through the 2.4-mile-long Spring Creek Tunnel.

REA Loans Authorized

Alaska: Matanuska Electric Assn., Palmer, $1,212,000 to finance construction of 118 miles of distribution line, 5 miles of 34.5-kv transmission line, 5 miles of tie line, and one 1,500-kva substation at Eagle River.

Colorado: Colorado-Ute Electric Assn., Montrose, $2,920,000 to finance construction of 93 miles of 115-kv transmission line, 41 miles of 69-kv transmission line, and four substations. This loan will enable the borrower to bring power into its transmission system from the Bureau of Reclamation's Collbran project.

Grand Valley Rural Power Lines, Grand Junction, $143,000 to finance construction of 26 miles of new tie line, and conversion of 19 miles of existing lines.

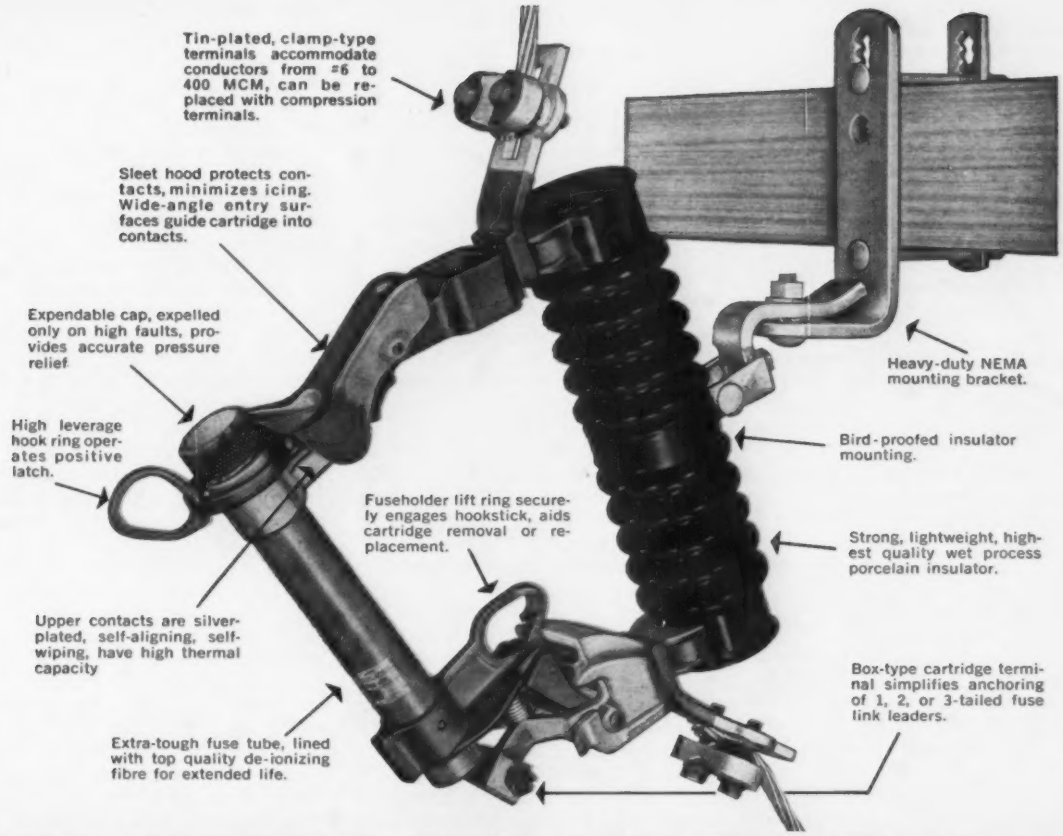
Montana: Sun River Electric Cooperative, Fairfield, $622,000 to finance construction of 26 miles of 69-kv transmission line, 60 miles of distribution line, 40 miles of tie line, and two 1,500-kva substations. Provision has also been made for other general system improvements, which include conversion of 119 miles of existing line.

New Mexico: Jemez Mountains Electric Cooperative, Espanola, $264,000 to finance construction of new headquarters facilities near Espanola.

Oregon: West Oregon Electric Cooperative, Vernonia, $100,000 to finance construction of 5 miles of distribution line and to make general system improvements.

Washington: Orcas Power & Light Co., Eastsound, $330,000 to finance system improvements including installation of two miles of new submarine cable between the islands of Lopez and San Juan, one mile of tie line, and conversion of seven miles of existing line. Seven miles of new distribution line will also be constructed.

► **The Eugene Water & Electric Board** has awarded a $14,798,670 general contract to Peter Kiewit Sons' Co. for construction of the 90,000-kw Carmen-Smith hydroelectric project on the Upper McKenzie River. The award was signaled earlier with sale of $25 million in bonds to finance the project.


Tin-plated, clamp-type terminals accommodate conductors from #6 to 400 MCM, can be replaced with compression terminals.
Sleet hood protects contacts, minimizes icing. Wide-angle entry surfaces guide cartridge into contacts.
Expendable cap, expelled only on high faults, provides accurate pressure relief.
High leverage hook ring operates positive latch.
Upper contacts are silver-plated, self-aligning, self-wiping, have high thermal capacity
Extra-tough fuse tube, lined with top quality de-ionizing fibre for extended life.
Fuseholder lift ring securely engages hookstick, aids cartridge removal or replacement.
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Strong, lightweight, highest quality wet process porcelain insulator.
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Washington Report

Mountain Sheep vs Nez Perce

The proposed High Mountain Sheep hydro power project apparently has the edge over rival Nez Perce proposal, according to engineering evidence developed by the Federal Power Commission staff for the conflicting license application hearings.

The FPC staff prepared and filed early in October a "neutral and factual" summary of engineering data on comparative aspects of the two projects. A recommendation won't be made by FPC until after the hearings on cross examination are completed. (They were scheduled to begin Nov. 4.)

High Mountain Sheep has been proposed by Pacific Northwest Power Co. for the Snake River just before its confluence with the Salmon on the Oregon-Idaho border. Nez Perce, to be located below the confluence of the two rivers, is proposed by 16 Washington PUDs.

The FPC staff stated that according to its figures, High Mountain Sheep would have a higher benefit-to-cost ratio than Nez Perce: 1.47-1 for High Mountain Sheep against somewhere between 1.22-1 and 1.35-1 for Nez Perce, depending on construction interest rates.

Wilfrid A. Frogatt, FPC engineer in the San Francisco district office, said that High Mountain Sheep's capital cost would be $190,652,000 at 5.5% interest, while the dam's annual costs would be $27,937,000 and its annual value over costs would be $13,148,000.

Nez Perce costs were figured by Froggatt at three interest rates—at 5.5%, Nez Perce capital cost would be $425,914,000, annual costs would be $43,474,000 and annual value over costs would be $9,579,000; at 5% interest, Nez Perce capital cost would be $413,007,000, annual costs would be $40,346,000 and annual value over costs would be $11,427,000; at 4.5% interest rates, Nez Perce capital cost would be $400,867,000, annual costs would be $37,433,000 and annual value over costs would be $13,131,000. In every case, Nez Perce costs would be higher, annual value less than High Mountain Sheep.

Another engineer in the FPC San Francisco office, James L. Lisk, determined High Mountain Sheep's weighted market value of firm power at $25.91 per kw-yr. He used Spokane, Portland, and Anaconda, Mont,. as market centers for the power, to be delivered over 230-kv lines. He said energy would be valued at 3.8 mills per kwh. High Mountain Sheep's year-round dependable capability would be 930,000 kw, based on the January low-water conditions.

Lisk figured Nez Perce's firm power market value on three revenue bond interest rates again: $19.99 (5.5%), $18.46 (5%), $17.77 (4.5%). This was based on market value at load centers in Spokane; Lewiston, Idaho; Santiam, Ore.; and McNary Dam on the Washington-Oregon border. Lisk said Nez Perce's energy should be valued at 2.37 mills per kwh and the dam's year-round dependable capacity at 1,867,000 kw, again based on January low-water conditions.

Comprehensive development of the middle reach of the Snake and Salmon Rivers—judged on alternative plans for related unbuilt projects—again favored High Mountain Sheep and Lower Canyon Dams (the latter on the Salmon River just above its confluence with the Snake) over Nez Perce and White Bird Dams (to be located upstream on the Salmon at the upper elevation of the Nez Perce pool. Allan J. Meadowcraft, a third FPC engineer in the San Francisco office, said High Mountain Sheep—along with Lower Canyon, Freedom, China Gardens and the three Hells Canyon Dams—would produce more prime power and lower cost than a combination of projects including Nez Perce plus White Bird, Freedom, China Gardens and the three Hells Canyon Dams. Meadowcraft made estimates of the plans for years 1969-70 and 1984-85, both showing that the Nez Perce combination would require higher annual operation costs than the High Mountain Sheep combination.

Both High Mountain Sheep and Nez Perce Dams met the minimum FPC requirements for maximum and low-level water discharge facilities, said FPC Engineer Jack M. Shepley, in the Washington, D. C., office. Shepley added that both dams' arch designs appeared to be structurally sound, although excessive tension stresses appeared in both dams' "crown cantilever" sections, suggesting a possibly greater curvature in the design might be advisable. Shepley said that the two dams' design and structure were good, if geology was found to be adequate but, oddly, there was no FPC staff comment on the possibility of faults at either site. Shepley said also that both Nez Perce and High Mountain Sheep spillway designs should be checked out on hydraulic models.

There was no mention in the FPC brief of fish facilities which, High Mountain Sheep proponents claim, is the weak link in the Nez Perce plan. However, a number of other intervenors filed in the case to complain of possible damage to migratory fish in the Salmon River by construction of Nez Perce. A good number of these intervenors chose High Mountain Sheep over Nez Perce only as the "lesser of two evils"—in that more fish could be damaged in the Salmon than in the Snake River.

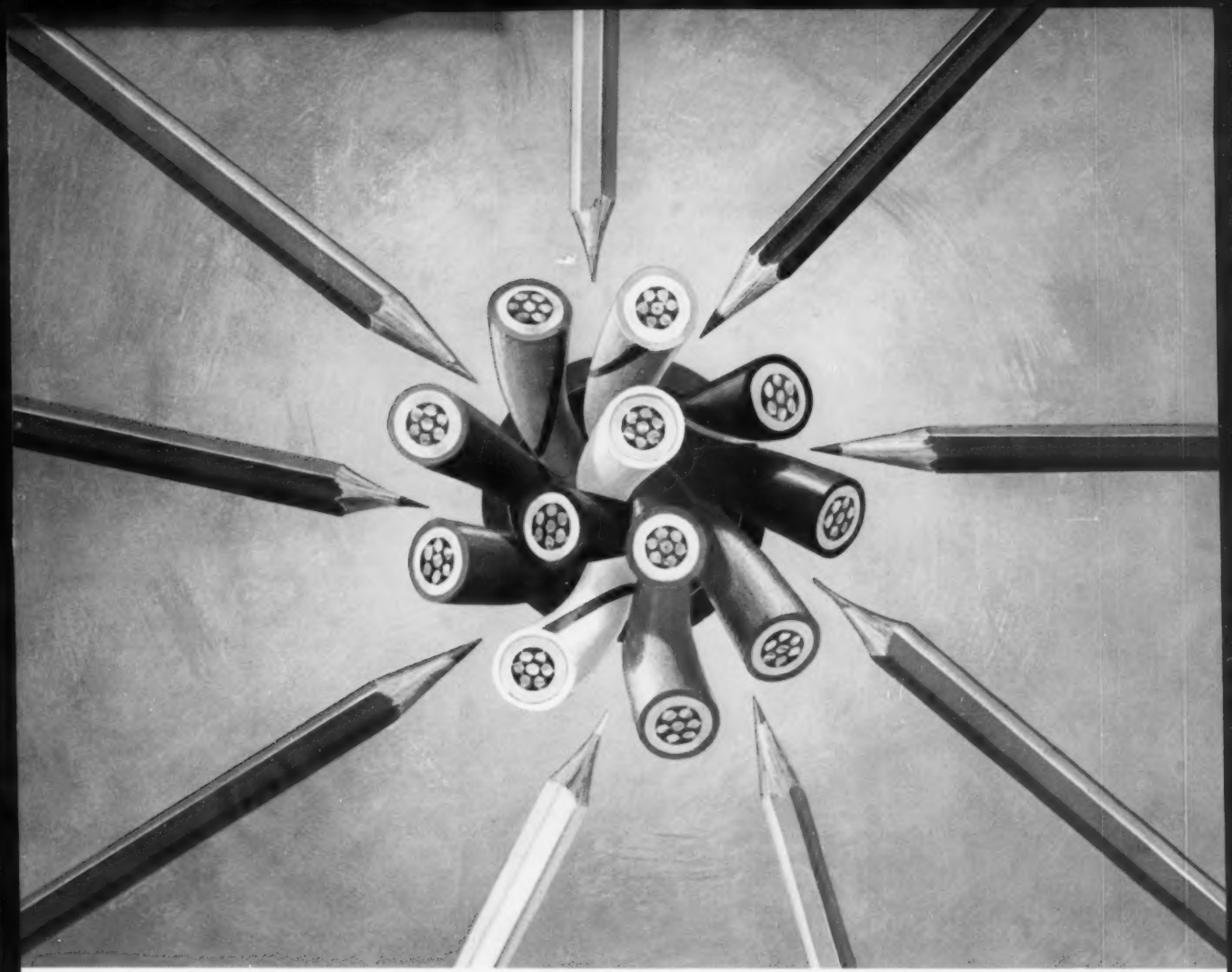
Several other groups, notably the Washington State Department of Conservation, came out for Nez Perce over High Mountain Sheep. Earl Coe, director of the Washington agency, said he had "unequivocally concluded" that Nez Perce "best provides for the control of floods, improvement of navigation, development of natural resources and supply of power for public interests" in the Pacific Northwest.

The Washington and Oregon state granges back up Coe, stating their views that Nez Perce would provide more and cheaper power, plus prevent the "monopolization" of power development by private interests, such as PNP.

The fish and game commisions of Idaho, Washington and Oregon, however, in a consolidated statement, criticized both projects for damaging migratory fish runs, but they added that since "political pressure" would force construction of one of the two rival plans, "a simple matter of arithmetic" favored High Mountain Sheep, since it could kill only a fifth as many fish.

The Idaho Wildlife Federation criticized Nez Perce because "no practical plan has yet been devised to successfully pass andromodous fish up and down over the 600-ft height of Nez Perce Dam." The federation referred to "extensive expressions" of criticism toward Nez Perce among its members, who "can hardly believe anyone would have the effrontery to cut off the salmon and steelhead (fish runs) from the Salmon River."

Another group of fish interests filed a consolidated series of statements against Nez Perce, including Washington State Sportsmen's Council Inc., Fishermen's Cooperative Assn. Inc., Northwest Fisheries Assn., Pacific Fish Conservation League, Makah Indian tribe.



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Nuclear News

Sodium Reactor Experiment

Atomics International, a division of North American Aviation Inc. has resumed operation of the Sodium Reactor Experiment (SRE) using a second core of thorium-uranium alloy fuel elements.

The SRE, located in the Santa Susana Mountains near Los Angeles, was operated for more than two years on the first fuel loading and provided heat for the generation of 15,300,000 kwh of electricity of the Southern California Edison Co. system.

Start-up of Sept. 5 marked the first time the reactor has operated since July 1959 when parted fuel elements were observed. The damage to the fuel elements occurred when the coolant passages became clogged by the inadvertent introduction of an organic material. The resulting reduction in coolant flow caused overheating of the fuel elements and their subsequent failure.

During the year-long shutdown 16 graphite moderator cans were replaced, remote inspection of the entire core structure was completed and a new loading of fuel placed in the core.

Radioactive Waste Handling

The relatively insignificant radiation coming from luminous dials and television sets will probably be greater than the average radiation from nuclear power operations in the United States during the next several decades, it is reported in a new study by the Edison Electric Institute's Technical Appraisal Task Force on Nuclear Power.

The report, "Radioactive Waste Handling in the Nuclear Power Industry," points out that the amount of radioactive wastes from operation of U. S. nuclear electric power stations and related fuel processing will not exceed for several decades that which has already been produced and successfully handled in U. S. atomic weapons production facilities.

Most of the radioactive material produced in connection with the generation of nuclear power will be generated at the power station sites. However, only a very small fraction will be treated or released there; most of it will be sent to spent fuel recovery plants. The intensely radioactive wastes extracted and stored at these recovery plants will contain all but a very small fraction of radioactive material produced in connection with the operation of power reactors.

The wastes from the recovery plants will have to be contained for as long as several hundred years, and some very long-lived constituents will require special handling even after this time. Present containment methods appear feasible and economically acceptable but eventually more effective and economical methods may be developed. Research and development toward this objective are under way.

The report concludes that the cost of properly handling radioactive waste will be a small fraction (1-5%) of the total nuclear power costs. It also concludes that there are no early prospects for utilizing waste radioactive materials so that they become an over-all economic credit rather than a liability.

G-E Public Opinion Survey

In May, General Electric Co. sponsored, on a nation-wide basis, a poll of 1,500 households to determine public opinion on the peaceful uses of atomic energy. Some of the highlights of the survey related to the use of the atom to produce electricity are:

52% felt that, when atomic power is being used to produce electricity, their electric bills will be lower.

62% felt atomic power should be used to produce electricity.

On the question of responsibility for development of the atom:

35% felt government should do it, 25% felt private industry should do it and 22% felt both should do it.

53% felt that quite a few power companies would be using atomic power in the next 10 years.

58% had no objection to an atomic-powered electrical plant being located in their city; but this percentage dropped to 38% when the location was changed to their neighborhood.

One person in eight stated simply that he wanted to know more about atomic energy; while one person in 10 expressed purely negative comments, e.g., "I think atomic energy is out of this world and man has tampered with something he has no right to tamper with."

► **Humboldt Bay nuclear plant fuel design** may be changed to stainless-steel cladding based on recent experiments with Zircaloy, which indicate that there may be a tendency in this material for small cladding imperfections to propagate to large cladding breaks.

Communications

FCC Rules on Tone Signaling

After some four years of contemplation, the FCC has announced proposed rule making on tone signaling as requested in 1956 by the NCUR. As a result of the petition the commission has allowed the use of tones on mobile frequencies in the Power Radio Service for alarm purposes at unattended locations; however, operation was permitted only when an actual outage of service occurred and no provision was made for any type of control signals that could be sent out from an attended station for the purpose of restoring service. The new proposal, which is incorporated in docket 13812, broadens the existing alarm functions by "automatically indicating abnormal conditions, or failures of equipment or service, in the power production, transmission or distribution facilities of a licensee. In addition, licensees may, by means of manually supervised tone or impulse transmissions, restore lost service, place stand-by or reserve equipment into operation, or correct any abnormal condition which, if not corrected, would otherwise result in an immediate failure in the licensee's production, transmission or distribution facilities."

The commission stressed the fact that, while the tones could be used on mobile frequencies above 25 mc, they could not be used if harmful interference was caused to another user who had voice communications. In other words, the use of tones is strictly secondary to voice communications and cannot be used as justification for obtaining licensing or expansion of mobile systems. Also incorporated in the proposal is an arrangement whereby an "electric power entity by reason of common ownership of contractual arrangement" may use its power radio licensed facility for the maintenance, etc., of other wireline facilities using the same pole plant or ducts. This addition was requested by REA who is authorized to construct both power and telephone facilities using the same supporting structures. The commission noted that previous to this proposal it would have been necessary for a service car to have two radios with separate licensing to service legally both telephone and power lines under these conditions.

In a second long awaited action the FCC announced that private microwave system licensing would soon

be implemented by rule making that would conform very closely with the principles enunciated about a year ago. At that time the commission had proposed a very liberal policy which would have allowed widespread use of private microwave systems, not only by right-of-way companies, but by other types of business enterprise. AT&T as well as other common communications carriers quickly filed objections, and as a result the commission stayed the rule making in order to permit them to file objections. Two of the major objections — that licensing of private communications systems would adversely affect the common carriers service to the general public and that intolerable frequency crowding would occur — have been found by the commission to be without merit.

The electric utilities, who were well represented at the hearings by the National Committee For Utilities Radio, have been in a strong position throughout and have had little fear of a seriously adverse decision, although the possibility that the commission would consider availability of common carrier facilities as a factor in granting a license could have been unpleasant. The exact manner in which power radio licensees will be allowed to operate their microwave systems will be spelled out in rule making proposals that will implement the general policy, assuming of course that the whole matter isn't taken to the courts by the common carriers.

► **Now that VHF-TV translators are legal** a number of remote hydroelectric power plants will no doubt wish to make use of them to replace the various schemes that have been employed in the past to get TV into the camps. Costwise, they should be somewhat less than UHF translators, which have been in legal use for some time, but in addition they will have two other advantages. Coverage will be improved as there will be less tendency toward sharp shadows because of the lower frequency and the rebroadcast will be on channels that are in more common use. This last feature will eliminate converters for the receivers which may be on hand in the low band or the purchase of all-band receivers with their extra cost and maintenance problems.

► **Extensive data logging system** will be used by Chelan PUD in its Rocky Reach hydro plant. Chelan will use Bailey Metrotype equipped for 110 points with an ultimate capacity of 170 points. Solid-state components will be used and the equipment will not only log numerical values but will check for off normal conditions and produce an alarm. The estimated cost of $85,000 will include not only the logic elements but the transducers that will be required to convert the information into digital form. A reduction in operating personnel is expected since they will be relieved of much of the time-consuming hand logging and checking of quantities to determine operating conditions and making comparisons.

Market Development

Longview's Super Value Market turns night into day with 21 20,000-lumen m-v lamps. Some 250 units have been installed by local businessmen under utility rental plan

Security For Rent

An imaginative approach to a customer problem is paying two-way dividends in Longview, Wash., where Cowlitz County PUD is building load by supplying commercial establishments with the lighting they need for security and promotion.

When operators of shopping centers, parking areas and service stations found they wanted more dusk-to-dawn lighting than the city could be expected to furnish, they went to the utility for help. The result is a contract under which the utility installs its regular street lighting standards on business property for a $5.50 monthly rental, including current and maintenance.

The utility, which can install the standards for an average of $250 each, makes a nice profit during the five-year life of the contract and builds good will in a city that is proud of its appearance. The property owner or businessman has the use of a 20,000-lumen lamp without paying out its purchase price and can charge the rental against tax-deductible operating costs.

Oddly enough the plan, which is working out so well, started with a failure. The rate schedule was ready when it was needed because Cowlitz PUD had set up a rental plan for protective lighting in the rural areas. The rural plan, which had been successful in other areas, found few takers around Longview, where farmers preferred to install their night lights on a do-it-yourself basis. To them a $3 a month flat rate looked big as compared with a mail order floodlight operated for about 25¢ a month.

But among the city's businessmen no real salesmanship is needed, according to Lacy Peoples, the utility's sales and commercial supervisor. "The business just comes to us," he said.

If a boost were needed, however, it probably would come from the police department, which has been advising those plagued with vandalism at night to see the PUD and have safety lighting installed.

► **Almost 1,800 homeowners have installed post lights** in their front yards as a result of a 90-day introductory sale conducted by Seattle City Light. Post lights were sold through branch offices and City Light's main sales floor.

Pictured following the Brainstorming session: P. C. Forward, B. C. Hydro; Lacy Peoples, Cowlitz County PUD; Gus Norwood, NPPA; Bill Crook, Coos-Curry Electric Co-op; W. T. Wascher, Benton Rural Electric Assn.; Howard James, Salem Electric; Ken Crow, Grant County PUD, section chairman who presided at the Longview workshop

Power Use Workshop Brainstorms on Wiring

A brain storming session—program innovation that seemed to please everybody—was a highlight of the Power Use Workshop of the Northwest Public Power Assn. at Longview, Wash.'s Monticello Hotel, Sept. 28-30.

Serving as a tryout for a technique that will be used at all NPPA workshops, the session was put on by the economics and research committee, with P. C. Forward as chairman.

The more than 30 topics suggested by the audience included such varied ones as rates, installation costs, customer education, youth training, financing, management indifference.

Winner by popular vote was "breaking the inadequate wiring problem," and for a couple of hours the group aired its ideas and beliefs informally and with candor.

Some of the many "blue sky" suggestions: modernize the state wiring code for future expansion; educate the contractors; help educate the do-it-yourselfers; get better trained utility personnel; let the utility furnish and install all wiring; standardize equipment, get packaged units; eliminate conduit.

Considerable discussion centered around subsidies and whether or not the utility should move in the direction of furnishing the box and main breaker. All were interested, though opinion differed. There were success stories to back up those who advocate owning the entrance equipment. Some would limit that program to old homes, expanding it to new ones only if necessary.

One speaker pointed out that a subsidy comes out of net income; by capitalizing through ownership of the entrance, the money will come back. Another commented: "Panels are better [as subsidies] than money but education is still better."

The meeting was a workshop in the best sense of the word, with good audience participation where it was called for and an interested audience for the speakers, both guest and member. The program itself was well arranged with a nice balance of interest in subjects discussed under leadership of the various committees—commercial and industrial; consumer service; farm and home; public service information; economics and research.

Since every delegate went home with bound proceedings, no attempt will be made here to summarize the talks. To indicate the type of material presented the following are given brief mention.

How the industry and the utility can work together to insure ample power at low rates was detailed by Conant Dodge, chief design engineer for Weyerhaeuser, who suggested that when the day comes in the Northwest that a source other than water power must be tapped, the two can work together to meet the situation in the most effective and efficient manner.

Elwood Caples, Vancouver attorney, discussed, "What Can PUDs Legally Do On Promotion," a topic of interest to the delegates, some of whom had had unhappy experiences in this field. A Caples suggestion: Before adopting any new promotional type venture requiring expenditure of district funds, submit an outline to the Division of Municipal Corporations for comment.

Utility interest in youth programs was reflected in a talk by Leland C. Strait of the Washington State College of Agriculture and a summary by W. T. Wascher, Benton Rural Electric, of the questionnaire sent out to the membership. Of 76 utilities answering, 23 have a planned youth program; 24 have no planned program but assist in a limited capacity; 29 do nothing to help youth.

Telling why industry goes where it does, Monroe Sweetland listed the Northwest's attractions; warned that no region is so blessed that it can sit back and watch while industries beat a path to its door. We must adopt programs and policies calculated to develop our latent resources and encourage new industries to establish in our midst, he urged.

Bernard Goldhammer, BPA, luncheon speaker, gave facts and figures pointing to a prosperous period in the sixties; added that, with concerted effort, power use potentials outlined can be realized and even exceeded.

At the business meeting, Harry Sherman, City of Forest Grove, Ore., was elected chairman of the Power Use Section, succeeding Ken Crow, Grant County PUD. Next year's

Harry Sherman, City of Forest Grove, who was elected Power Use Section chairman, with Gus Norwood, NPPA executive secretary, after the business session

workshop will be held in Forest Grove.

Lacy Peoples, sales and commercial supervisor of Cowlitz County PUD, the host utility, headed the arrangements committee, which provided a cordial welcome and good entertainment.

Show Color TV, Bureau Speaker Tells Dealers

Dealers who fail to show color TV risk customer disappointment and criticism, H. R. Maag, RCA vice president, told an audience of more than 500 at the fall conference of San Diego Bureau of Home Appliances. Many will be seeing more color and will want it after you've sold them a black and white set, he warned.

W. F. Chapman, San Diego Gas & Electric Co. vice president, was conference chairman and J. Clark Chamberlain, bureau manager, coordinated activities. Program chairmen were Ben Jacobson, outgoing president, and Tony Combs, incoming president.

More color sets are being shown on the floors, Maag said, and dealer orders are running well ahead of last year. Number of retailers displaying four or more sets is up 300% as compared with 1959.

Other favorable factors: the new camera tube that permits telecasting night baseball and studio shows with regular black and white show lighting; stepped up programming, with an increase of 50% in NBC's schedule alone; a steady plateau for color sets, with prices relatively unchanged and few major changes in performance levels.

Ralph N. Zeuthen, manager of the Live Better Electrically program, reported on that organization's interviews with women in 11 market areas. He said the study, which has been used in preparing LBE's advertising program, showed that women don't really want emancipation from home work. Instead, they want to be responsible for cooking, laundry and cleaning; they want recognition from their families for these tasks; they believe that working at housekeeping is necessary to gain and keep a husband's affection. Therefore, appliances should be presented to them as modern, automatic machines that will help them to better fill their responsibilities as homemakers.

E. W. Meise, who is retiring as San Diego Gas & Electric Co.'s residential sales manager, was given a plaque of recognition and named honorary director of the bureau—the first in its history.

Division chairmen for the new year: **Electrical Contractors,** Sam L. Hall Jr., Electric Supplies Distributing Co.; **Kitchen,** Wayne Butt, Aztec Cabinet Co.; **Air Conditioning,** Dick Huntington, University Mechanical & Engineering Contractors; **Electronics,** Charles Copeland, Copeland's Radio & Television.

New officers: Seated, President A. R. Combs, Wedgewood-Holly; Wilma Furstenfeld, H. L. Benbough Co., first vice president; H. R. Ascher Jr., Home Appliance, second vice president, standing; Jerry Heilbron, Heilbron Electric Co., treasurer; Ben Jacobson, Cabrillo TV & Appliance, immediate past president

Eighteen of the bureau's 22 living past presidents turned out to help honor Ed Meise, its first president, who is retiring from San Diego G&E. Here Harry Callaway, Thearle Music Co., presents a bronze plaque conferring an honorary directorship

► As it went into its third quarter, **Southern California Edison** announced that it had signed up some **1,500 builders in its Medallion Home program.** This compares with about 800 contractors who were participating in the campaign at the beginning of the year. The company said that the number of Medallion dwelling units completed during the first half of 1960 was up 21% from the corresponding figure for 1959.

► **Celebrating** the installation of its 100,000th electric meter, Salt River Project in Arizona staged a two-day program. Among the events were a dinner for more than 300 leading citizens of the area and ceremonies at the new Gold Medallion Home in which the 100,000th meter was installed. **Victor I. Corbell,** project president, officiated at installation ceremonies.

Walter Chapman, conference chairman, looks over the program with Hal Maag

A. B. Couch, residential sales director, and H. B. Batchelder, Central division sales manager, for Puget Sound Power & Light Co., look over one of the "sold" lots in Somerset. Future residents in this total electric community will have a view of Lake Washington, Mt. Rainier, Seattle, Mercer Island and the Olympic Mountains

Somerset — A Total Electric Community

Residents of the Puget Sound area are justly proud of the beauty of its natural setting. Among the highest users of electricity in the nation and happy with their electric servants, they like wherever possible to have their view lots served underground.

This public sentiment, coupled with an aggressive manufacturer and a sales-minded utility, is bringing into reality what may be the first total electric community in the United States—Somerset project, with a potential of 3,500 lots to be served underground. The view sites are in a tract overlooking Lake Washington in the Bellevue area.

The UG project was born when General Electric, who has the contract for all electric equipment in the first phase, under its RMDO plan, got in a huddle with the serving utility, Puget Sound Power & Light Co. As the result of cooperative planning by G-E, Puget and the Evergeen Land Developers Inc., a feasible plan for underground electric service was evolved.

Underground is already in for the first phase, which includes 63 lots, many of them sold. Phase two, with 168 lots, is ready to go. Homes will be in the $25,000 and up class.

The underground distribution system employed direct burial cable and pad-mounted transformers. The cable was butyl insulated. The telephone cable was buried in the same trench directly above the power system. Electric terminations were made inside the transformer cabinet and were tape insulated.

A team from Puget Sound Power & Light toured the West Coast studying various underground systems prior to selecting this type of installation as best for residential projects in its area.

Puget's philosophy is that the property should support the difference between the cost of an overhead and an underground service installation. Therefore, under the agreement, the owner of any home that does not qualify for a Gold Medallion will reimburse the utility for its additional service cost. Actually there probably won't be many backsliders.

Puget's plan to push the total electric (Gold Medallion) concept is the core of a five-year "hard sell" program to be started in 1961.

Puget, which does not pay subsidies, is competing with utilities that do. As R. F. Plymire, vice president-general commercial and sales, says it, "the company prefers to put its money into capital investment for facilities to enable the customer to obtain the best possible service at the lowest feasible cost."

General Electric is working with the 13 builders and contractors at Somerset and is offering substantial promotional funds, including trips to Europe for builders and advertising money to publicize the initial construction phase of the development.

Somerset is not the only underground tract underway in the area and its $40,000 entrance with tiered waterfall may not be the most elaborate. But the beauty of the site and its panoramic view makes it particularly suitable for promotion as a total electric community. When completed the development will include churches and schools, parks and recreational areas, a shopping mall.

And adding a little to the charm of the place is the story of its origin. As this story goes some 25 years ago a woman living with her family on the other side of the lake looked across at the timber land on the hill and dreamed of building a cabin there. Urged by her husband and children to buy a lot and build her cabin she found she could get 160 acres for almost the same price as 20 acres. In the end the family put about $3,000 in 384 acres, which brought more than $1,400,000 when sold to Evergreen Land Developer. This land is the nucleus for Somerset, where Mrs. Delia Whatmore's view will be enjoyed by hundreds of families.

► Addressed to plant executives, **"Lighting for Industry,"** recently published by **Better Light Better Sight Bureau,** is designed to supplement efforts of utility power salesmen in gaining acceptance for the new higher lighting levels recommended for the industry. The booklet is available from the bureau, 750 3rd Ave., New York 17. Twenty-five cents each in quantities under 100.

► A fact book on **home fixture lighting** has been released by **American Home Lighting Institute,** 360 N. Michigan Ave., Chicago 1. Single copies are available at $1 each.

► As part of its tie in with National Home Week, Sept. 24 to Oct. 2, the Los Angeles Department of Water & Power presented a mobile exhibit of all electric Medallion Homes to nine locations in the city. The exhibit included pictures, plans and other information. The truck-mounted exhibit was shown at shopping centers where umbrella-shaded tables were set up and refreshments were served.

► Kathleen Brick has been appointed Pacific Coast home economist for Norge, succeeding Edna Poyner, who was transferred to Chicago.

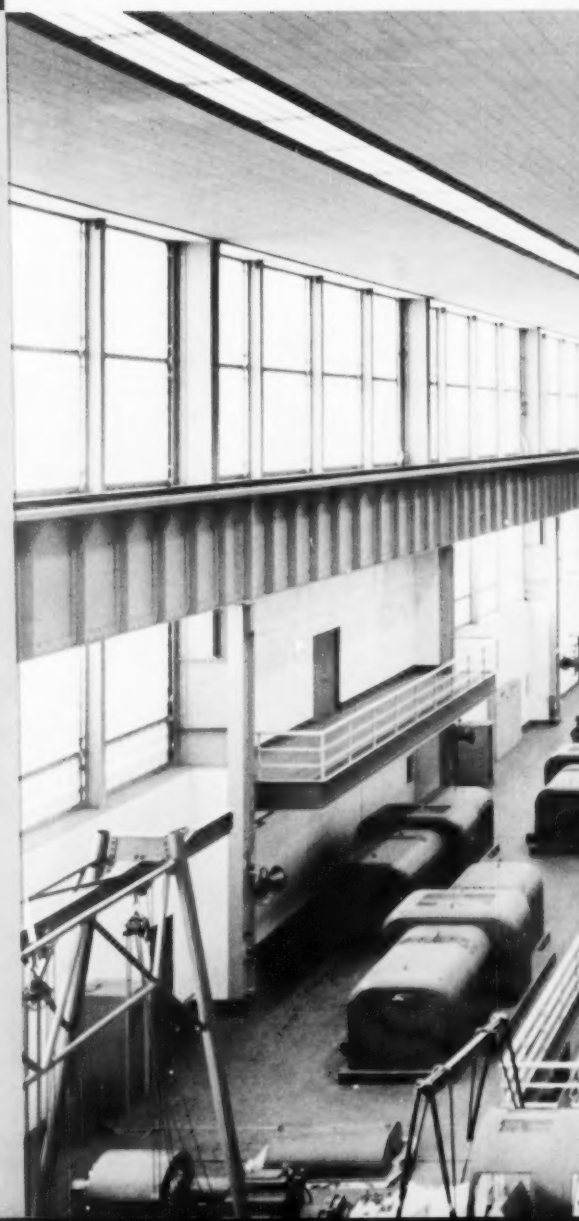
New Bergen Generating Station helps Public Service Electric and Gas Company of New Jersey meet huge load growth

The Meadows, 50,000 acres of swamp, is the last frontier in the industrial development of northern New Jersey.

In the construction of Bergen, 4400 concrete piles were driven to refusal. The average length of each pile was 105 feet. A total of 800,000 cubic yards of fill was needed for the immediate area of the station. In all, over 45,000 cubic yards of concrete and 8000 tons of structural steel were used.

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

Westinghouse designs unique turbine-generator . . . first cost, operating costs plummet



Jersey straddles main transportation routes of the East, spawns new industry along city belt

Benjamin Franklin once described New Jersey as a "barrel tapped at both ends," pouring its people and produce into Philadelphia to the South and New York in the North.

Lying along the corridor linking Philadelphia and New York is the territory of Public Service Electric and Gas Company of New Jersey, serving over one and a third million customers. Demand on electrical service in this area has set new records for each of the last 12 years. In 1959, a peak of 12¾ billion kilowatt-hours of output was reached.

The growth of New Jersey, which has caused Public Service to increase capacity tenfold in 40 years, shows no signs of abating . . . promises to be even more spectacular in the 1960's. Use of electricity in homes and in commerce is increasing substantially and continuously. Spiralling power sales to plants signal even greater growth and diversification of the state's industry. In 1959, for example, over 180 new plants sprang up on the system.

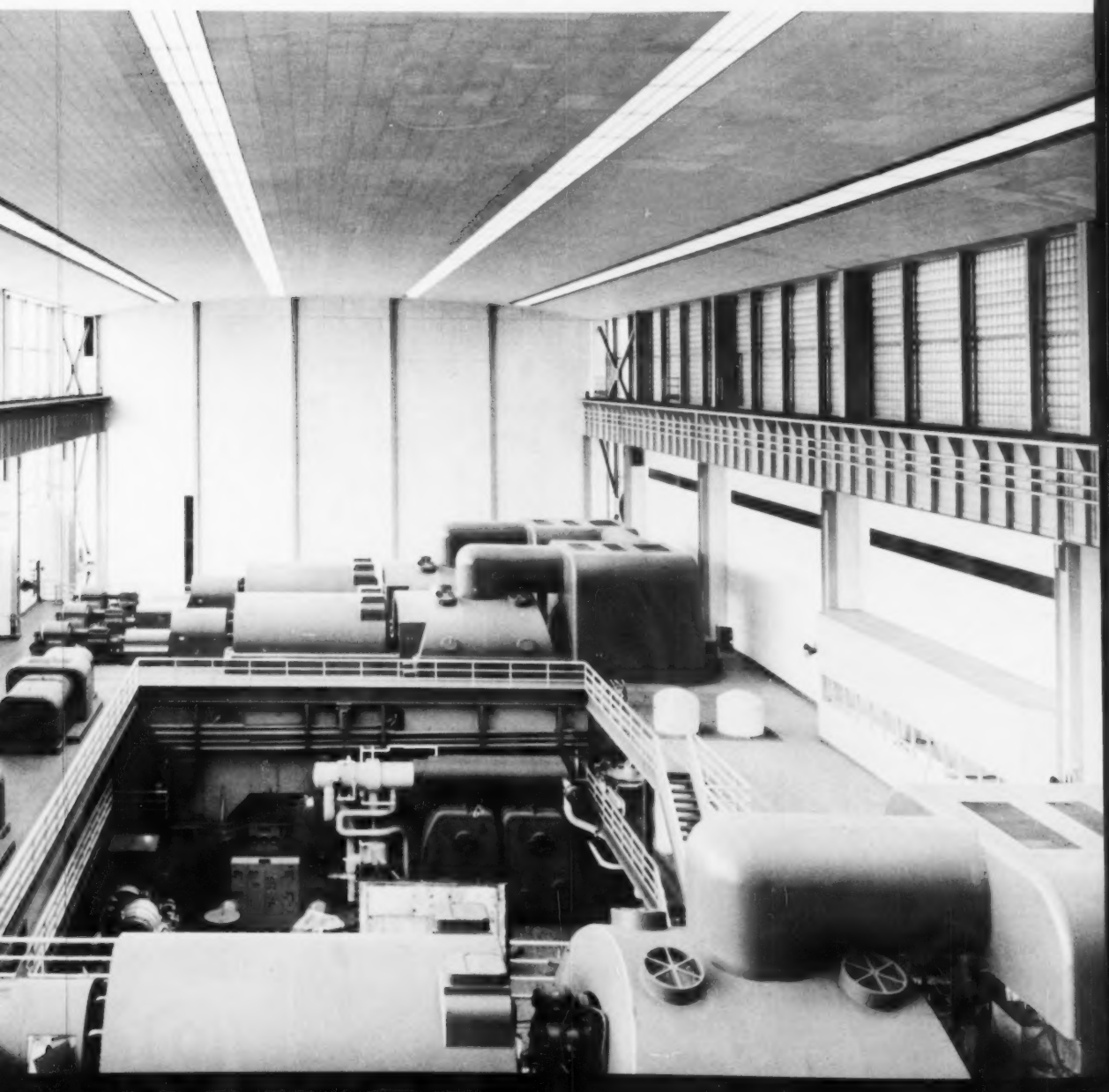
At the outset, Public Service stands to save a half million dollars in original cost by virtue of an unusual design idea.

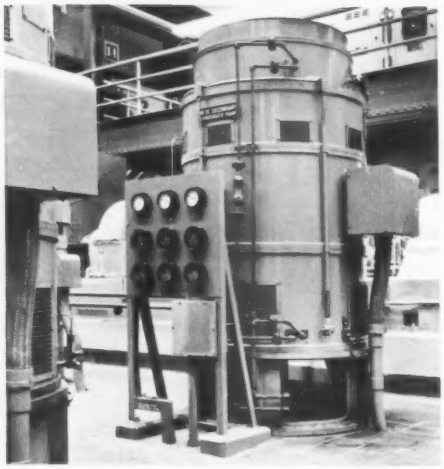
Pioneered jointly by Westinghouse and the utility is a new concept in large turbine-generators. Bergen's two 290-mw, cross-compound, 3600-rpm units are identical twins with high-pressure equipment on one shaft and the intermediate pressure on the other. Four identical generators and low-pressure turbines result in a major integration of components and compactness of design that are translated into substantial savings in initial station costs. Among these are lighter foundations, less space, lower shipping and handling expense.

Boiler feed pumps are driven by the generator shafts, eliminating the customary motors and controls, and stepping up operating efficiency. In addition, requirements for auxiliary electric power are cut.

The inlet pressure of this quadruple-flow machine is 2350 psig, with initial temperature of 1100°F with one reheat to 1050°F. The generators are hydrogen inner-cooled through both stator and rotor.

Here is one more example of how Westinghouse and the electric utilities are designing toward lower capital investments and higher practical capacities in an era of booming power loads.





Reliable high-speed vertical motors...

The world's largest high-speed vertical motors power Bergen's six secondary condensate pumps. At 900 hp, these motors are over 28% more powerful than the previously largest 3600-rpm vertical motors.

Bearings and their lubrication and cooling are the keys to such high-performance vertical-shaft machines. The Kingsbury-type bearings are of Westinghouse manufacture. They are oil-lubricated with water cooling.

Entire alarm system checked in minutes...

A unique static annunciator system was custom-engineered for Bergen by Westinghouse and Public Service. The system monitors 560 critical points in the station. Maintenance is reduced to a minimum by the use of static system components with an easy-to-replace design.

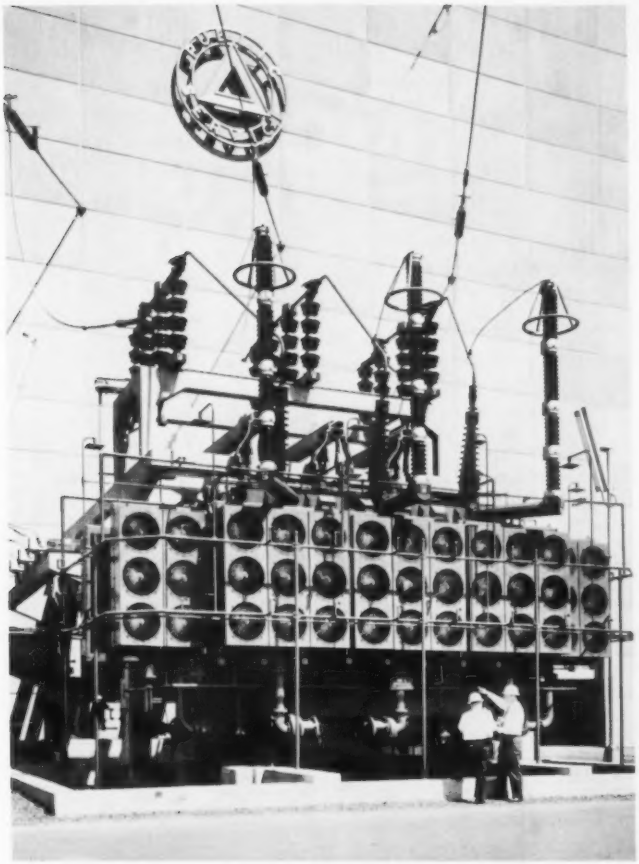
Westinghouse Cypak® logic elements were integrated with magnetic amplifiers to form an alarm system which provides a new standard of reliability. There are two different audible alarms plus flashing light and steady light indications. These four signals assure positive trouble-spotting, even while the system is undergoing periodic checks. Testing the new system is greatly simplified over previous annunciator applications.

The test station, as well as all of the components of this wholly static system, is located in the control room. There, one man can check the entire 560-point system in a matter of minutes.

Versatility unlimited...

The 4150-volt metal-clad outdoor switchgear used in the Bergen Generating Station is typical of Westinghouse switchgear. In addition to the inspection and test convenience offered by the horizontal drawout Type DH breakers, reliability of the metal-clad switchgear is assured by its factory-assembled wired-and-tested construction—benefits of standardized unit design. In addition, unit responsibility and coordination of all components assure longer life, installation economy and long-term maintenance savings . . . all designed into Westinghouse equipment.

POWER CENTERS also are matched to the electrical functions of Bergen. Among the many advantages of these units are the operating conveniences and safety of Type DB breakers used in low-voltage switchgear. Their three-position drawout features allow them to be placed in the connected, test or disconnected position with the cell door closed—a positive safety characteristic.



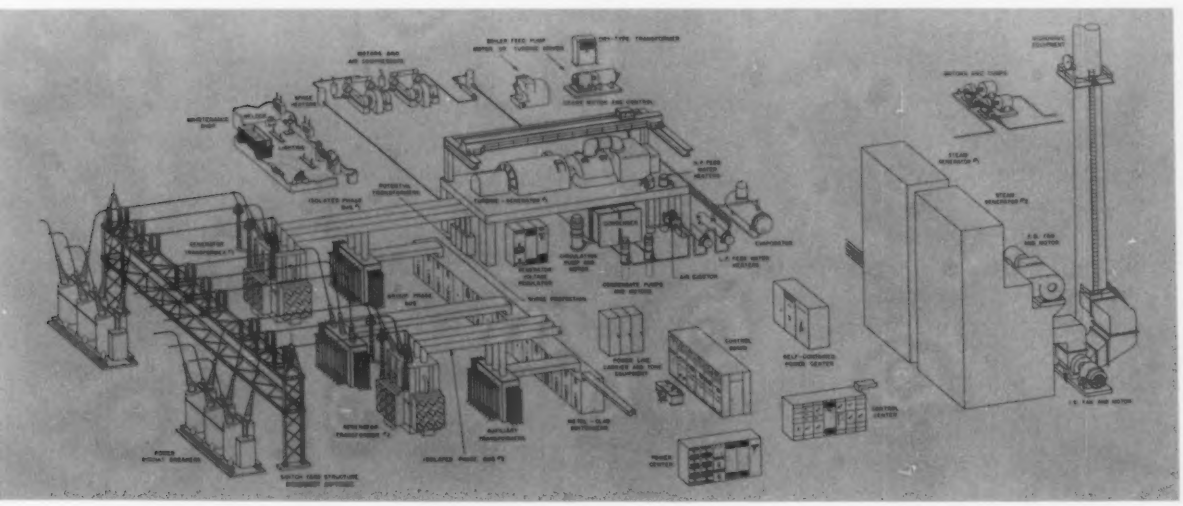
Compact and reliable . . .

One of twin units, this 325-mva, 138-kv Westinghouse transformer moves Bergen's power through as compact a design as can be bought. Three features are responsible for this smaller, lighter equipment that must stand on Jersey's bog.

First, forced-oil cooling with forced-air cooler. The result is efficient, continuous cooling and the smallest transformer at the lowest initial expense for any given rating.

Second, Westinghouse exclusive "Form-Fit" design. Snug fit of tank and core-coils reduces the amount of oil required and, again, slashes dimensions and weights.

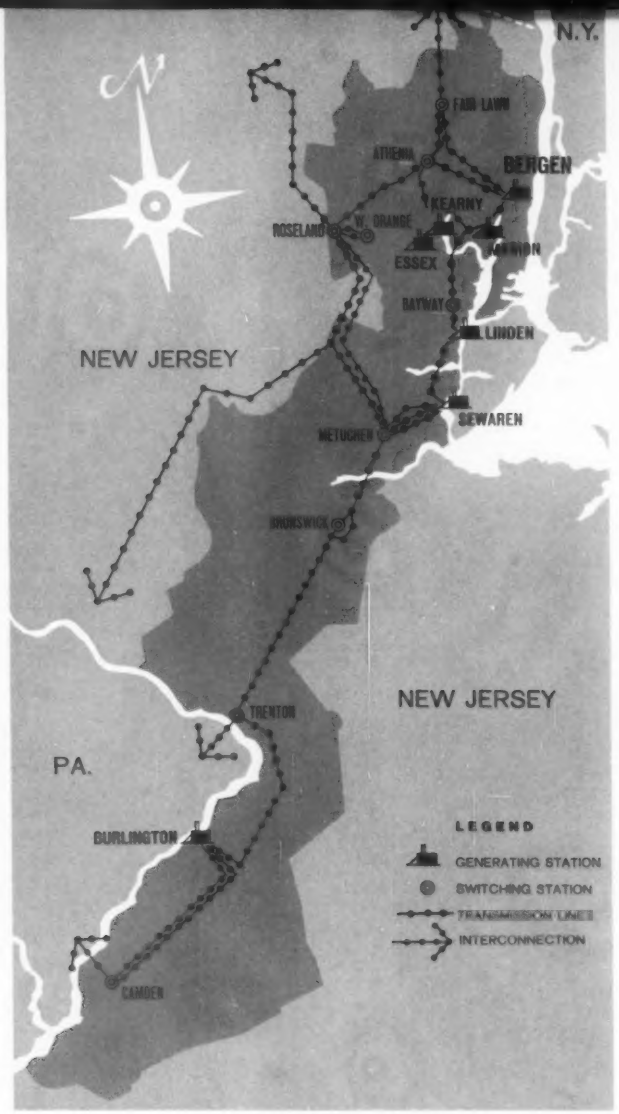
Third, shell-form construction. Long, straight ducts permit oil to move freely from bottom to top. This factor, plus the high volume flow of forced circulation, means maximum coil-to-oil contact and heat transfer. The inherent efficiency of this arrangement reduces the amount of construction hardware and, together with the bulk-saving of forced-oil cooling and Form-Fit design, cuts foundation weight and cost.



These are only a few of the benefits which Public Service has realized from these unexcelled ideas in Westinghouse transformer design. Longer equipment life, increased safe-overload capacity and lowered maintenance of Westinghouse transformers have accrued proved savings of $100,000,000 for the electric utility industry.

This is an account of how one utility met the challenge of progress and its load demands . . . and how Westinghouse cooperated with engineering experience and equipment. Your Westinghouse representative can bring you similar assistance. The wide variety of coordinated equipment he is prepared to supply is diagrammed above, in part. Call him for the most complete service available in the industry. You can be sure . . . if it's Westinghouse.

Westinghouse



$110,000,000 Bergen Generating Station added to Public Service system

THIS 580-MW INSTALLATION IS THE LARGEST WESTINGHOUSE COORDINATED PROJECT TO DATE. Bergen Generating Station is the largest operating station in the Public Service system, and is a part of the $500,000,000 expended for construction in the last five years. With its two 290-mw units, Bergen adds 20% to installed generating capacity bringing the system total to 3,154,000 kilowatts. Bergen's 580 megawatts of new generating capacity now team up with the other six operating stations in the Public Service system to supply more than 1,390,000 customers in 223 New Jersey communities.

Beefing-up activity on the system provided four new substations and additional capacity at many existing substations. Levittown, a 15,000-home community under development in Burlington County, is the first beneficiary of a new high-voltage distribution system. Voltage was raised from 4150 to 13,200 volts . . . increased capacity cut number of substations, improved service.

Public Service is interconnected with neighbors in New Jersey, Pennsylvania and Maryland in system interchange. New generation from Bergen brings total capacity of this power pool to over 12 million kilowatts. The pool, in turn, is tied in with systems in New York, New England and the Washington area.

All of these measures are proving highly effective. Thorough-going system integration and system tie-ins are assuring an improved degree of service reliability during both daily and seasonal load peaks. You can be sure . . . if it's Westinghouse.

CP 1058 Litho in U.S.A.

Westinghouse

People

► **Charles W. Niederauer** has been appointed **Ebasco's** Northwestern regional manager for the Management Consulting Division with headquarters in Portland. He succeeds **William F. Rooney,** who recently became director of business development for the division at New York headquarters.

► **Robert E. Blasen,** Westinghouse apparatus marketing manager at Spokane, was chosen by the U. S. State Department as one of 18 Americans to visit Europe and the Holy Land as part of the continuing "People to People" program. He left Spokane Oct. 18 and was home on Nov. 14.

► **Archie W. Snyder** was promoted at Seattle City Light to the post of supervisor of its electric appliance service division succeeding **Samuel T. Denny,** who retired Oct. 1. Snyder has been with the utility for 20 years and has been assistant supervisor of the division for the past two.

► **Harvey O. Banks,** California director of water resources since 1956, announced his resignation, effective Jan. 2. He will take a position as vice president in a new San Francisco office of Leeds, Hill & Jewett Inc., Los Angeles consulting firm. In his new post he will join Walter G. Schultz, who resigned earlier from the department and also will be a vice-president for Leeds, Hill & Jewett. Banks reportedly has wanted for some time to return to private engineering practice. He said he had agreed to stay in the department until January to do everything possible to insure that California's vital stake in water resources development is explained to the people of the state.

► **Gerald A. Petersen,** president of Petersen Engineering Co. of Santa Clara, Calif., presented a talk on tension stringing methods of line construction to power system engineers from more than 50 countries at the recent International Conference of Large Electric Systems in Paris. He was accompanied to the meeting by **J. T. Isbell,** vice-president in charge of sales for Petersen.

► **Dennis Mears,** staff engineer, has been made assistant to the president, International Power & Engineering Consultants Ltd. of Vancouver, B. C. This firm was established last April as the result of a merger of B. C. Engineering, former subsidiary of B. C. Electric, and the Canadian branch of the British firm of Balfour Beatty. It also includes B. C. & B. B. Consultants, a firm set up by the two engineering concerns to handle consulting work for the Peace River Power Co.

► **Montana Power Co.** has transferred **Lester E. Ammondson** from Great Falls to Livingston as Bozeman-Livingston division engineer. **Donald M. Leuschen** has gone to Glasgow from Bozeman to be an assistant superintendent in the Great Falls division.

► For participation in community affairs and in youth groups, **Harry E. Krug** received the **Westinghouse Citizenship Award.** He is sales engineer for the company's apparatus division with headquarters at La Mirada, Calif.

► **William C. Brown,** partner in Blomquist & Brown, Salt Lake City, was named president of the **Intermountain Institute of Consulting Engineers.**

► **John M. Patton,** administrative officer of USBR's Region 4 at Salt Lake City, has retired after 26 years of federal service. He will join Hercules Powder Co. at its Bacchus plant.

► **President E. M. Naughton** of Utah Power & Light Co. has been appointed to the University of Notre Dame's Advisory Council for Science and Engineering.

► **E. O. Larson,** former director of Region 4, USBR, has been named a vice president of Berger Associates, international engineering and design firm, at Salt Lake.

► Two Westerners received their Fellowship degree in the Illuminating Engineering Society at the recent National Technical Conference in Pittsburgh. They are **G. B. Buck** of the Rocky Mountain Section, district engineer, General Electric Lamp Division, Denver, and **Philip F. O'Brien,** Southern California Section, University of California at Los Angeles.

► After an absence of seven years, **Wayne H. Johnson** has returned to Cowlitz County PUD in Longview and has been made assistant manager. He has been most recently in Albuquerque with the Department of Internal Revenue in Indian affairs. His previous post with the utility was as commercial sales engineer.

Howard Arnett has resigned as vice president of Portland General Electric Co. to accept appointment as manager of domestic power reactor sales for General Electric's Atomic Products Division at San Jose, Calif. An electrical engineer, he joined PGE in 1936 and was made a vice president four years ago. He took up his new duties Nov. 1

► **Preston L. Adkins,** who has been with the North Pacific Division, U. S. Corps of Engineers, has accepted a position as electrical engineering consultant with the Pakistan government. His headquarters will be in Lahore with the engineering firm of Miner & Miner International, supplying consultant services to Pakistan.

► **Clarence Soliday** has been named superintendent at Washington Water Power Co.'s Long Lake Dam on the Spokane River. He replaces **Lyle H. Noble,** who retired after 24 years with the company.

► **Lee Burnside** is the new engineer of street lighting design for the **Department of Water & Power,** Los Angeles.

► **Hector J. Durocher,** customer service officer at the Spokane area office of Bonneville Power Administration, has been promoted to head of the area operations and maintenance division. **Donald J. Harris,** former electrical engineer in the Spokane and Seattle offices, will succeed him in the service department. Both are electrical engineering graduates of Montana State College.

How Day-Brite lighting helps a school prepare for tomorrow

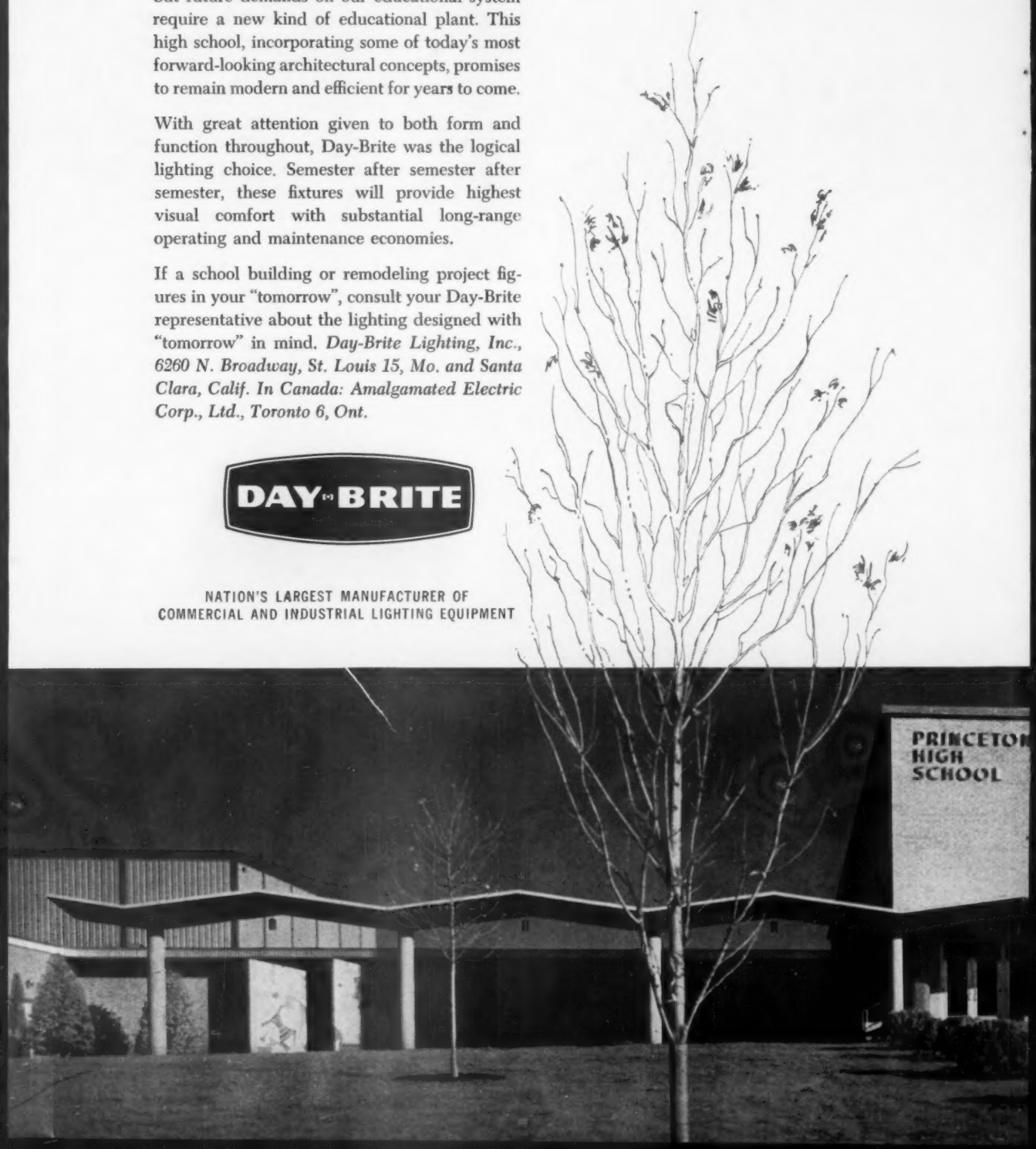
The "little red school house" was fine in its day, but future demands on our educational system require a new kind of educational plant. This high school, incorporating some of today's most forward-looking architectural concepts, promises to remain modern and efficient for years to come.

With great attention given to both form and function throughout, Day-Brite was the logical lighting choice. Semester after semester after semester, these fixtures will provide highest visual comfort with substantial long-range operating and maintenance economies.

If a school building or remodeling project figures in your "tomorrow", consult your Day-Brite representative about the lighting designed with "tomorrow" in mind. *Day-Brite Lighting, Inc., 6260 N. Broadway, St. Louis 15, Mo. and Santa Clara, Calif. In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ont.*

DAY-BRITE

NATION'S LARGEST MANUFACTURER OF
COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT



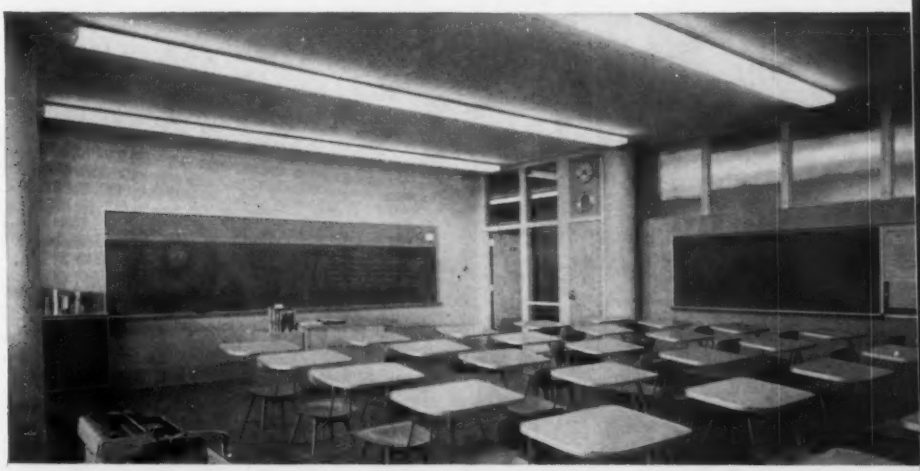
Superb Day-Brite Holiday fixtures maintain a minimum lighting level of 70 footcandles.

Princeton High School,
outside of Cincinnati

Architect:
Potter, Tyler, Martin and Roth

Consulting Engineer:
Fosdick and Hilmer

Electrical Contractor:
Beltzhoover Electric Co.



Molded acrylic plastic enclosures control light prismatically, eliminating glare.

► Ending a 44-year career with the Washington Water Power Co., **Edward C. Gralapp** retired as construction superintendent. He started as a groundman and during recent years was associated with most of the company's major electrical construction projects.

► **William Nordeen,** former manager of the Douglas County, Wash., Public Utility District, has been named manager of Northern Lights Inc., succeeding Ora Beasley, who resigned as head of the rural electric cooperative at Sandpoint, Idaho.

► **Milton S. "Sam" Umbenhauer** has joined the Ralph M. Parsons Co., engineers-constructors of Los Angeles, as manager of the recently formed power division. He will be responsible for power plant engineering and business development in the utility industry. Umbenhauer was most recently with Fluor Corp. as manager of power engineering. At one time he was associated with Consolidated Edison Co. and American Electric Power Co.

Umbenhauer

► **Richard R. Thompson** has been named a project engineer in the Manufacturing Division of Southwestern Engineering Co. and will specialize in the thermal and mechanical design of tubular feedwater heaters used by steam power plants. Headquarters of the firm are at Los Angeles.

► **Arthur J. "Ted" Willmott** has been appointed home consultant on major appliances for the Honolulu Electrical Products Co.

► **Robert L. Jannen** has been made assistant vice president of Leach Corp. of Compton, Calif., with responsibility for sales and marketing. According to **J. K. Dysart,** vice president, the move was to further strengthen the newly centralized corporate sales organization. As part of the program, Leach has recently opened sales offices in Los Angeles, Seattle, San Francisco, Dayton, New York and Cleveland.

► **Stanley S. Sievers** has been made vice president of marketing for Pelco Sales Inc. of Gardena, Calif. This firm is a manufacturer and sales outlet for closed circuit TV accessories.

► **Hubbard & Co.** of Emeryville, Calif., has appointed **William Featherstone** as its product sales manager, West Coast Division, reporting to **Ray M. Waggoner,** vice president for the West Coast. Featherstone will have responsibility for sales and marketing, training and engineering. He will work with district sales managers and distributors throughout the 11 Western states.

Featherstone

► **F. O. Wallaston** has been appointed a director of Crippen Ruskin & Associates Engineering Ltd. of Vancouver, B. C. He formerly was head of the electrical department of International Power & Engineering Consultants, Vancouver.

► **Henry C. Glaze** Jr., Spokane area manager for General Electric for 14 years, has been made Pacific Northwest regional manager, electric utility sales, with headquarters at Seattle. The Spokane post will be discontinued and operations in that area will be under the Seattle office. Glaze has been with G-E since 1934.

► **C. H. Brittenham** has been appointed manufacturing manager for Federal Pacific Electric Co., Pacific Manufacturing Division. He will be in charge of manufacturing operations at the company's new plant in Santa Clara, Calif. Before joining Federal Pacific, Brittenham was associated with Square D Co. as production control manager and plant manager at various locations.

Brittenham

► G-E has transferred **John Gogins** from Portland to Denver. He will be manager of utility sales operations for the Rocky Mountain region.

► **Pat Whelan** has joined the sales staff of Bruce Emmett Co., Seattle office. His main responsibility will be for the Tacoma-western Washington area.

► **James H. Joyner** has been named manager, Hawaiian sales, for H. K. Porter Co. with responsibility for sales and service. Before taking his new post, he was Western regional sales manager for Porter's Thermoid Division.

► **Robert W. Kerr** has resigned as president and director of Fairbanks, Morse & Co. to become president of Fluor Products Co., a division of the Fluor Corp. He was also elected vice president and a member of Fluor Corp.'s board of directors. A graduate of the University of California at Los Angeles, Kerr has been a newspaper writer and financial analyst. From 1938 to 1948 he was employed by Plomb Tool Co. and later went to the Bingham-Herbrand Corp. as vice president and general manager of the Herbrand Division. He was elected corporation president in 1950. His next assignment was with American Machine & Foundry Co., where he was a vice president and group executive between 1954 and 1959.

Kerr

► **A. D. Stone** Jr. has succeeded R. J. Hedberg as West Coast sales representative for General Electric insulating materials. His headquarters will be at 10234 Lakewood Blvd., Downey, Calif.

► **Robert M. Cohen** has been named manager of superheat reactor physics at G-E's Atomic Power Equipment Department in San Jose, Calif. He formerly was supervisor of nuclear engineering at the company's Aircraft Nuclear Propulsion Department, Cincinnati, Ohio.

► **W. Frank White** has been made manager, Western region, for the NICAD Division, Gould-National Batteries. He will headquarter in Los Angeles and be responsible for sales activities for nickel-cadmium batteries.

► **Arthur Dahl,** who retired last year from General Electric Supply after long service and subsequently was connected with the Charles A. Langlais electrical contracting company, has joined F. M. Nicholas Co., manufacturers' representative, San Francisco.

► **Philip R. Keep** has been appointed manager of applications engineering at Atomics International, succeeding **Dr. Robert L. Loftness.**

► **Victor Kostuck** has been made vice president of Leach Corp. He joined the company 6½ years ago as a divisional district manager for the Pacific Northwest states and recently has been serving as an assistant to President Kenneth F. Julin. Kostuck will now have the responsibility for all corporate planning and for its implementation.

Kostuck

► **C. V. "Bud" Harris** has set up a manufacturers' representative branch of **Strohecker** Inc., Spokane, Wash. He was formerly manager of wiring supplies for Tubbs Electric. Lines promoted will be Thomas & Betts, Wiremold, Edwards, McGill and Hubbell in eastern Washington, northern Idaho and Montana.

► **Arthur E. Gallien,** former dean of the USC School of Architecture, has become director of planning, Harland Bartholomew & Associates, Honolulu.

► **Benn Hartmann** has been made president of Flood-Lite Service, Los Angeles, succeeding **Harold Freeman,** who died recently.

► **M. C. Very** has returned to San Francisco from Houston, Tex., and is serving as general sales manager for Curtis-AllBrite.

► **Paul S. Schmidt** has been transferred back to San Francisco by the G-E Large Lamp Department.

► **Jerry Lansky,** formerly director of public relations for Fedders Corp., has been made district sales manager for the Pacific region. With headquarters in Los Angeles, he will cover the States of California, Arizona, New Mexico and Las Vegas, Nev.

► **A. C. Lucas,** formerly manager of Phillips Electric Co. at Vancouver, B. C., is now representative in B. C. and Alberta for the Appliance Division of Manitowac Equipment Works in Wisconsin.

► Hyster Co. has appointed **Hugh Richmond** to supervise special products engineering department activities in Portland as well as in Danville, Ill. He joined the company in 1951 at Portland in the engineering department and for the past four years has been special products engineering department supervisor in Danville.

► **Kenneth A. Peirce** has joined Honolulu Electrical Products Co. Ltd. as treasurer-controller. He formerly was with the Von Hamm-Young Co. where he was assistant treasurer.

► **Lauritz A. Kolby** of Appliance Service Center, 609 S. Second East, and of Time & Instrument Co. at 57 Richards St., Salt Lake City, was elected president of the **National Appliance Service Assn.** at its convention in Phoenix.

► **Harold H. Mitchell,** formerly chief engineer of the Kelman Power Circuit Breaker Division of I-T-E Circuit Breaker Co., has joined the King Machine & Mfg. Co. of Los Angeles. As vice president he will be responsible for engineering, machine work sales and special products. The firm makes machine and production tools.

► Westinghouse has appointed **Allen Georgenson** as an air conditioning and heating sales engineer with headquarters in Los Angeles. He previously was associated with the Lennox Co. as assistant to a division sales manager and sales engineer.

► **John W. Healy,** formerly located at G-E's Hanford Works in Richland, Wash., has been appointed consultant-technological hazards for that company with headquarters in New York.

► **Blayne A. Swift,** operator of the Warden-Swift Tool Co., has been named sales manager for BullDog expansion anchor products in the San Francisco Bay and northern California area.

Deaths

► **Charles Kuchel,** for 35 years partner in the firm of Kuchel & Sievers, San Francisco, died Sept. 6 of leukemia. A native of Illinois, he had spent most of his life in California and was a graduate of the University of California. Two years ago he received his 50-year certificate at the Electric Club of San Francisco.

► **Louis B. Gawan,** 65, consulting electrical engineer, Salt Lake City, was killed in an automobile crash near Castle Rock Sept. 24. Mr. Gawan, who, as consulting engineer, had a long list of major buildings and projects to his credit, originally started with Utah Power & Light Co.'s lighting staff. The original electrical design for the Los Angeles Temple of the Mormon Church, the Beneficial Life Building in Salt Lake City and more recently the new Salt Lake City airport building were among his outstanding projects. He was a member of Illuminating Engineering Society and AIEE.

► **Harry J. Bauer,** former president and chairman of the board of Southern California Edison Co., died suddenly in Pasadena Sept. 11. He was prominent in many local activities and corporations in addition to his work for the Edison company. Mr. Bauer started with Edison in 1908 in the legal department. He was president from 1932 to 1945 and board chairman from 1945 to 1954.

► **Ed H. Lewis,** who only recently sold his Western Insulated Wire Co., Los Angeles, to Penn-Union Co., died suddenly of heart failure Oct. 4 in Los Angeles. He had always been prominent in southern California industry affairs and the colorful leader of the enterprise which he started modestly and developed to full business stature.

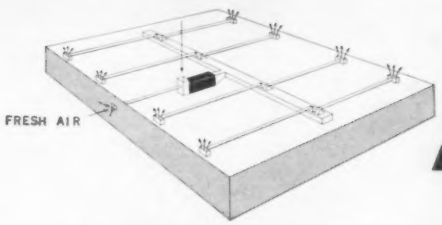
► **Mrs. Seth Cohn,** wife and partner with her husband in Atlas Electric Co. of San Mateo, died in September after a lengthy illness.

► **Ralph R. Mathews,** 58, executive assistant to the Vancouver Island Division, B. C. Electric, died at Victoria, B. C. He retired a year ago because of ill health. He topped the polls in Oak Bay Municipal election in 1958 but had to resign that post also for health reasons.

► **William M. Graham,** 58, electrical engineer and electrical contractor, died Sept. 20. A graduate of Montana State College, he worked for General Electric Co. in various locations until coming to Portland in 1938. He founded Graham Electric Co. in 1947 and it became Boynton-Graham Electric Co. He was a member of the Oregon-Columbia Chapter of NECA.

► **Cecil N. Parker,** planning engineer for California Electric Power Co., died recently at the Kaiser Foundation Hospital in Fontana, Calif. He suffered a cerebral hemorrhage while conducting a meeting of the Riverside-San Bernardino Counties industry education council of which he was president. He started with Calectric as a senior student in 1924.

new! LENNOX *fresh air*



Controlled amounts of fresh outdoor air help make complete comfort possible.

LENNOX®

World's largest manufacturer of indoor comfort equipment

ELECTRIC HEATING

...PROVIDES COMPETITIVE ADVANTAGES NEVER BEFORE AVAILABLE TO UTILITIES

✳ *Beats the humidity and stale air problems common to tight, heavily insulated homes.*

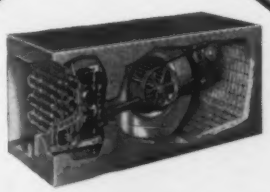
✳ *Gives complete comfort with accurate temperature control.*

✳ *Makes air conditioning inexpensive to add—helps equalize your winter and summer load demand.*

This is the heating system you can push—knowing it will benefit your customers and your company. Here's why:

Lennox Fresh Air electric heating ends moisture problems. It provides controlled amounts of fresh outdoor air to prevent dampness and stagnation. Household odors can't linger on and on. Gentle air circulation creates a refreshing atmosphere . . . *all* the heat is put to use, doesn't stratify; solar gain is distributed throughout the house. Already field reports indicate that operating costs are as much as 20% less than non-ducted electric systems.

This is a *real plus* . . . the blower, filter and ducts can be used for low cost central air conditioning. Also, advanced air filtering and purifying devices are added easily. *Your customers get 365-day comfort—you sell electricity the year around!*



Compact electric furnace—17" x 19" x 42". Zero clearance. U.L. label. 11.4 kw in two steps (39,000 Btuh). May be installed for up, down or horizontal air flow—in basement, crawl space, closet, etc. Complete flexibility of installation.

Other fresh air electric equipment

- **Heaters for individual room control**
- **Heaters for zone control**
- **Larger central units**

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FREE *electric heating manual*

Lennox Industries Inc.
Marketing Services Dept.
705 S. 12th Street, Marshalltown, Iowa

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Company.....

Address.....

City.....*State*.....

My Name.....*Title*.....

For phone number of closest representative see advertising index in back of book.

The *right* extension cord is essential for safe, dependable operation of on-the-job equipment and temporary lighting . . . the *right* size to carry the load, the *right* length to supply the power without voltage drop. That's why there's a Royal heavy-duty POWR-KORD to fit *every* job. Available in one quality (the very best) . . . two types (rubber and vinyl) . . . three colors (red, black, yellow) . . . four wire sizes (12, 14, 16, 18) . . . and over five handy cord lengths (10 to 100 ft.). See your wholesaler. He has the facts — and Royal POWR-KORDS in stock, ready for your work.

ROYAL ELECTRIC
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Meetings Calendar

NOVEMBER

3-4—*American Home Laundry Manufacturers Assn.*, 14th National Home Laundry Conference, Fairmont Hotel, San Francisco.

25-Dec. 3—*San Diego Bureau of Home Appliances*, annual Electric and Home Appliance Show, Electric Building, Balboa Park, San Diego, Calif.

DECEMBER

1-2—*Pacific Coast Electrical Assn.*, Administrative Services Section, Hotel Safari, Scottsdale, Ariz.

12-15—*Atomic Industries Exhibition*, Masonic Auditorium, AIF—Fairmont Hotel, ANS—Mark Hopkins Hotel, San Francisco.

JANUARY 1961

15-20—*Los Angeles Winter Market.*

23-37—*San Francisco Winter Market*, Merchandise Mart.

FEBRUARY

5-11—*National Electrical Week.*

APRIL

—*Rocky Mountain Electrical League*, spring meeting.

5-9—*Electrical Maintenance Engineers Assn. of Northern California, Electrical Industry* Show, Brooks Hall, San Francisco.

6-7—*Pacific Coast Electrical Assn.*, Engineering & Operating Section, Ambassador Hotel, Los Angeles.

17-18—*PCEA*, Business Development Section, Sheraton-Palace Hotel, San Francisco.

26-28—*Northwest Electric Light & Power Assn.*, Engineering & Operation Section, Personnel & Safety Section, Purchasing & Stores Committee, Sheraton-Portland Hotel, Portland.

27-28—*PCEA*, Administrative Services Section, spring conference, Villa Hotel, San Mateo, Calif.

MAY

1-2—*Illuminating Engineering Society*, Intermountain Region Conference, Hotel Utah, Salt Lake City.

3-5—*IES*, South Pacific Coast Region conference, Sacramento Inn, Sacramento.

8-9—*IES*, Pacific Northwest Region conference, Davenport Hotel, Spokane.

—*National Electrical Contractors Assn.*, Tri-District annual meeting, Sun Valley, Idaho.

17-19—*Pacific Coast Electrical Assn.*, annual conference, Sheraton-Palace Hotel, San Francisco.

24-26—*Northwest Electric Light & Power Assn.*, Accounting & Business Practice Section, Medford Country Club, Medford, Ore.

JUNE

11-14—*Electrical Apparatus Service Assn. (NISA)*, national convention, Jack Tar Hotel, San Francisco.

ACTUAL TESTS* PROVE

Allen-Bradley Standard Duty Push Buttons can be installed

in about half the time!

In accurately timed tests, Allen-Bradley standard duty push buttons required *about half the installation time*—on the average—than each of four other popular makes. This saving in installation time means "dollars" saved on the job.

How come only famous A-B standard duty push buttons possess this time and moneysaving advantage?

The answer lies in the molded, wrap-around cover—which also contains the contacts. When the cover is removed, the wiring terminals are *out in the open*—ready for wiring—and you have plenty of working space. The two cover screws are captive—they cannot fall out and get lost. And with the contacts in the cover, they are protected against accidental damage and careless wiring. Naturally, these push buttons have double break, silver contacts that never need service attention. There are two concentric knockouts on each end of the base, which are removed from the *outside*—the heavy, pressed steel base will not bend out of shape.

Your local A-B distributor has these Bulletin 800 push buttons *in stock*. Call him today—you'll save time and money on your next job.

**Using recognized standard duty push buttons, installations were made by an experienced electrician under identical conditions. He was not connected with Allen-Bradley Company in any manner.*

A-B STANDARD DUTY PUSH BUTTONS
Made as a one-, two-, or three-unit station—with pilot light available. Readily changed for horizontal or vertical mounting. Convertible two- or three-way selector switch supplied with or without pilot light.

29-60-M

ALLEN-BRADLEY

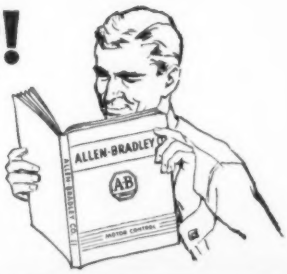
Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ontario

QUALITY MOTOR CONTROL

Some more special controls that are "standard" with Allen-Bradley!

Even Khrushchev couldn't claim a more complete line!



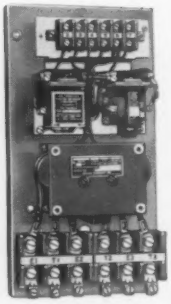
A-B QUALITY

Phase Failure Phase Reversal Relays

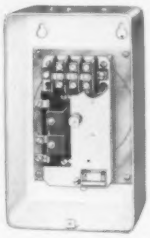
The Bulletin 812 Style RF relay responds to *all* open phase conditions on a branch motor circuit and immediately removes the motor from the line. Also, the motor is disconnected when a phase reversal occurs anywhere in the system on the line side of the relay. "Fail safe" design.

Phase Failure, Style F covers f.l. currents from 1.5 to 300 amp in 4 sizes. Coils to 600 v, 60 cycles.

Phase Reversal, Style R made with coils for 110, 208/220, 440, 550 v for either 50 or 60 cycles.



Bulletin 812 Style F



Bulletin 812 Style R

Zero Speed Switch

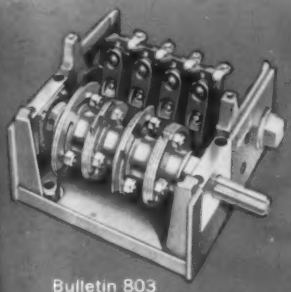
Used for "plugging" duty, these switches prevent coasting and bring squirrel cage motors to a sudden stop. Also used to prevent application of reverse power before motor comes to a full stop. Adjustable operating speed.

Bulletin 808

Low Pressure Switch

Especially designed for domestic water pump service and commercial air compressor service. These inexpensive compact switches offer pressure ranges from 15 to 200 psi.

Bulletin 830



Bulletin 803

Rotating Cam Limit Switches

Heavy-duty pilot controls used on rotating machines to initiate functions at any point of rotation. Made with up to 12 individually adjustable, independent circuits.

Bulletin 805

Foot Switches

Built for toughest service. Has maintenance free, snap-action contacts. Extended base prevents tipping. Made with hood (left), with top guard and without guard.

Bulletin 836 Style T

Pressure Controls

Oiltight enclosure for machine tool hydraulic systems operating at pressures up to 5000 psi. Operating pressure and differential are adjustable. Indicator shows trip point. Silver contacts never need service attention.

Bulletin 837 Style A

Temperature Controls

Newly designed bellows provides lower differentials. Rugged construction permits continuous cycling from zero to maximum setting. Vibration or mounting angle will not affect accuracy of operation. Temperature ranges from —150°F to 490°F.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

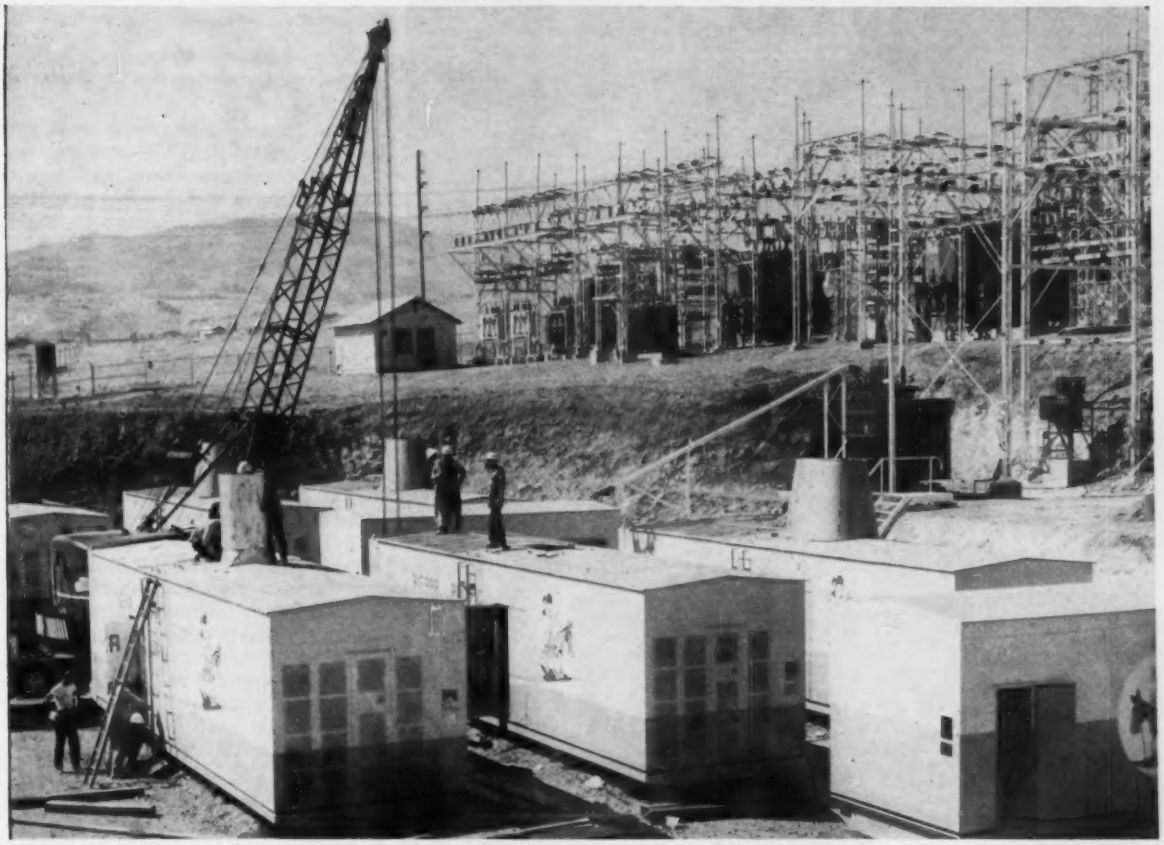
ALLEN-BRADLEY

Member of NEMA

Quality Motor Control

29-60-M

ELECTRICAL WEST SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S. VOL. 125, NO. 5 NOVEMBER 1960



Sierra Pacific's generation plans call for . . .

"PEAKING POWER FIRST"

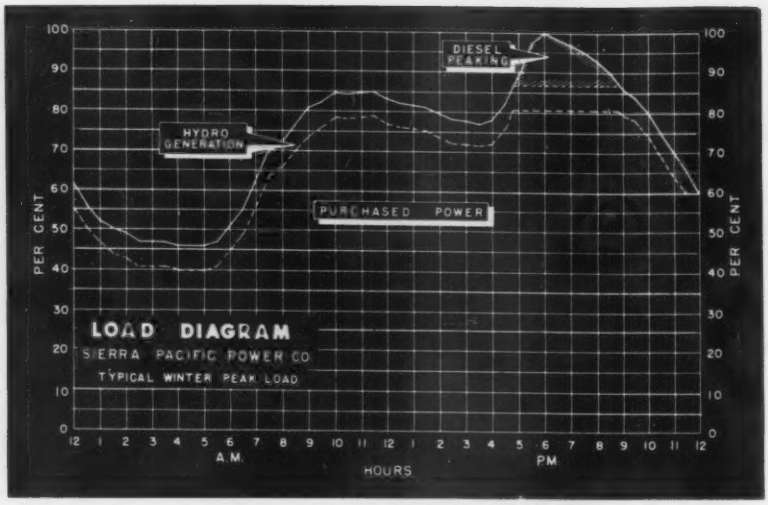
M. L. ATCHESON, VICE PRESIDENT, ENGINEERING, SIERRA PACIFIC POWER CO.

To cover anticipated 1960 winter peak demands Sierra Pacific Power Co. is installing 18,000 kw of diesel-driven peaking generation. Two groups of three 2,000-kw units have been installed at Valley Road substation near Reno, Nev. A third 6,000-kw group is being installed at Brunswick substation near Carson City, Nev.

The installations consist of three type MU-60 package plants manufactured by Electro-Motive Division of General Motors. Each package is made up of three 2,000-kw, 4,160-v engine-generator units and one control and switching unit. The control unit contains three 4,160-v drawout air circuit breakers, starting battery, generator controls, instruments and automatic synchronizing equipment.

At Reno each 6,000-kw group is connected to a 24-kv subtransmission bus through a 6,000-kva, 4,160-24,000-v transformer. The 12,000-kw combined output of the two transformers is switched to the 24-kv bus through a 24-kv oil circuit breaker. The output of the Brunswick group will be stepped up from 4,160 v to 63 kv, and connected through power fuses. For system VAR supply during peaking operation, each group may be operated at 7,500 kva, 80% pf.

It is anticipated that the forthcoming winter peaks on the Sierra Pacific system will range up to 136,000 kw during the months of November



1. Sierra Pacific load diagram showing both present and anticipated typical winter peak load and the portion that it is anticipated will be handled by peaking units

2. Railroad crane was employed on the first units. Later two mobile cranes were used as the boom of the rail crane was too short to give adequate clearance for loading units

3. Two cranes working in unison unload one of the generator units at the Reno site

through February, and will occur between 5 and 7 p.m. The duration of operation of some units will range from one hour to 4½ hours per day, depending on the date, temperature and weather conditions.

Sierra Pacific is engaged in a program shifting from a utility that purchases most of its power in the direction of one that generates substantial portions of its requirements. The initial steps will involve various stages of peaking and semi-peaking operations. It is anticipated that the economics of generating power in the Reno area will dictate a policy of base loading with purchased power for some time.

Base load on the Sierra Pacific system is purchased from Pacific Gas and Electric Co. and is transmitted via three transmission lines about 60 miles in length, which cross the Sierra-Nevada range at Donner Summit. This interconnection is supplemented by four small Sierra Pacific hydro plants with a combined output of about 9,000 kw.

Push Button Operation

When supervisory control circuits have been completed all units will be under remote control for unattended operation. The control and dispatch center is located at Reno substation about 35 miles from the Brunswick installation, and about three miles from the Valley Road units. Leased telephone circuits will be utilized for the Valley Road control and power line carrier circuits for Brunswick.

Control cables and the 400 mcm rubber covered power cables between units are placed by direct burial in sand-filled trenches. The main output cables to the step-up transformers consist of parallel pairs of 500 mcm shielded neoprene insulated conductors carried overhead in a ventilated trough.

Peaking Economics

The total installed cost of this generation will be about $110 per kw.

This cost includes land, considerable excavation for site preparation,

fencing, step-up power transformers, steel and bus work, oil tanks, piping, cables, auxiliary power supply transformers, communications and control circuits, one 24-kv oil circuit breaker, one group of 69-kv fuse assemblies and administrative overheads. The engine-generator units with their control equipment unit, connecting cables, lube oil and supplies, cost about $88 per kw delivered at Reno.

Of basic consideration when selecting any type unit is the relative quietness. Noise levels of the present units have been found to be lower than anticipated. Therefore, zoning problems connected with future units should be minimized.

Routine maintenance of the diesel generators will be handled by existing Sierra Pacific personnel who have been or will be trained at a special course offered by the manufacturer. The electrical components will fall within routine maintenance schedules.

Regular automotive diesel fuel will be utilized, each MU-60 group being supplied from a 20,000-gal supply tank.

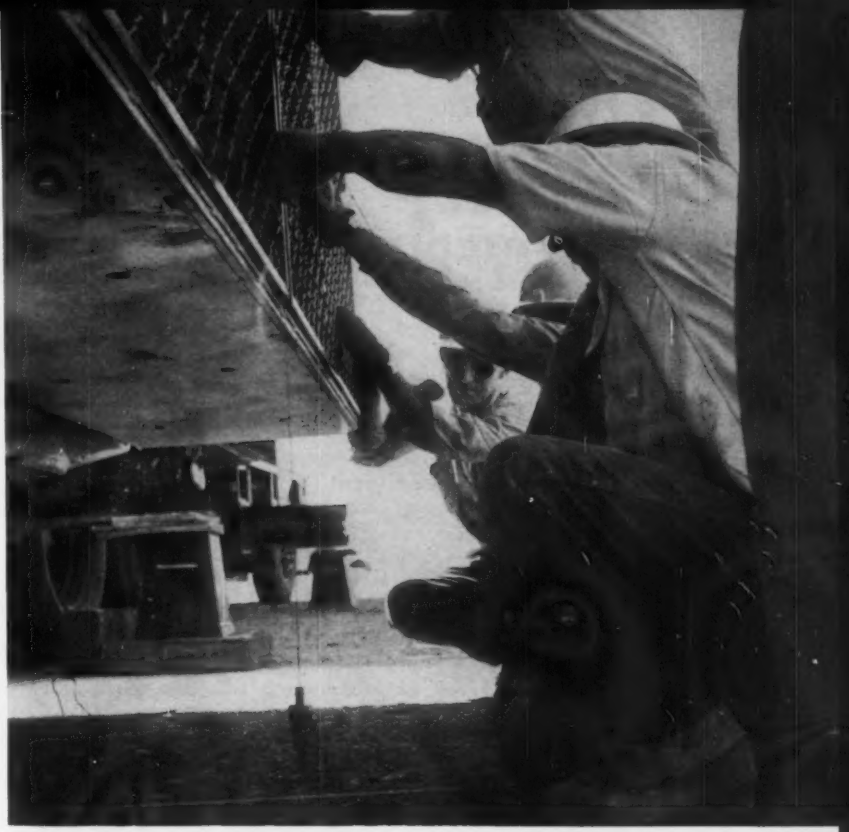
These units are located so as to supplement the existing base load transmission system. They will be very helpful in assuming a portion of the load when it becomes necessary to remove various segments of the transmission line for maintenance and repair.

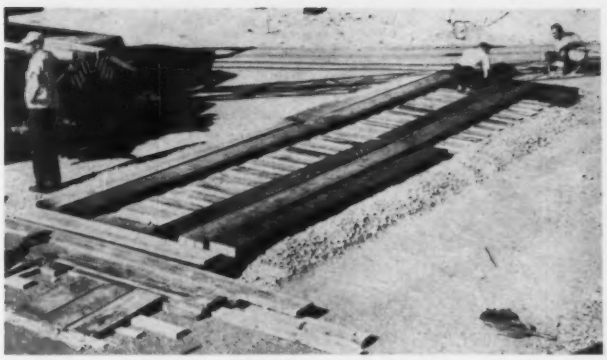
Generation Plans

Stone & Webster Service Corp., acting in an advisory capacity, is aiding Sierra Pacific in making a study for a six-year generating program.

F. A. Tracy, president, announced that present plans call for about 20 mw additional peak capacity in 1961, to be followed by another 25 mw in 1962. He also stated that all types of plants—diesel, gas turbine, etc., will be considered for this added capacity.

Subsequently it is planned to supplement purchased base load power with steam generation. Present plans visualize a plant 60 mw or larger.





4. Sierra Pacific personnel check the alignment of one of the engine generator units prior to lowering it on to its base

5. Although prepackaged for easy installation, the generator sites still required careful preparation. They were graded and prepared by a highway construction firm

6. Good hands make quick work and the units are set on their bases ready to be connected into company's growing load

The Easy Way To

OVERHEAD LINE LABOR DISTRIBUTION

RODNEY P. COLTON, INTERNAL AUDITOR, PORTLAND GENERAL ELECTRIC CO.

Let's take a look at this fellow, the line foreman, to see what is expected of him if he is to do a good job. He must be a competent supervisor so that there is complete harmony among his crew members. He must be a safety expert so that his crew members will not cook themselves on a hot lead, which can be a real problem when his crews are spread out over a mile of line. He must be an expediter who can meet the schedules handed down from top management. He must be an accountant since he is the only one who knows what is going on in the field. His penmanship may cause some concern, particularly when his hands are so cold that he can hardly bend his knuckles, let alone hold a pencil. By and far, the line foreman is a very qualified employee in his own right, but what about the accounting responsibilities placed on him?

Electric utility accounting poses problems even to the experienced accountant; but the man suddenly thrust into the position of line foreman with little accounting instructions must immediately assume responsibility for distinguishing between maintenance and construction charges. Small wonder, therefore, that he sometimes seems to reason that everything that goes up is a capital expenditure and everything that comes down is a retirement. It is further understandable why foremen frequently distribute time charges arbitrarily rather than attempting to make the precise labor distributions required to record accurately the work done. It is not unusual for the job estimator to work hand in hand with the foreman so that actual time charged will be close to the time estimated. These are the factors that prompted Portland General Electric Co.'s management to attempt to devise a simplified labor accounting distribution for all overhead line construction.

Overhead line work at PGE is covered by formal work order estimates on jobs with expenditures in excess of $7,000; minor jobs with expenditures of less than $7,000 are covered on job orders.

The bulk of the labor distribution originates on minor jobs or job orders. Frequently, it is necessary to distribute labor charges to seven or eight accounts on one job order. A crew may do as many as four jobs a day. Simple mathematics will indicate it is a complicated matter to distribute eight crew hours to 32 accounts.

Some utilities have simplified labor distribution systems for minor jobs that relieve the line foreman of charging crew time directly to the accounts. Usually, however, office clerks by various means allocate the crew hours to the accounts that would have been normally charged by the crews, thereby simply transferring the labor accounting distribution from operating to clerical personnel. This did not appear to be a decided improvement.

Periodic studies of minor overhead line construction jobs led the PGE accounting staff to believe that minor job orders could be classified by job types. For example, it appeared to the staff that labor charges on jobs providing for a transformer installation would always be substan-

Only 19 Job Types!

tially to the same accounts, and the only variation in the labor charges between jobs would be in the amount of time spent. To prove this theory, 2,300 job orders were reviewed and it was found that approximately 90% of the jobs could be classified into one of 19 job types. For all practical purposes, the labor charges were common for all jobs within each type. The following are two examples of the job types and related accounting distributions determined by the analysis of the 2,300 job orders.

Job Type 6 — Transformer Replacements or Removals includes but not limited to:

Job Description
1. Replacing or removing transformers
2. Removing transformer racks
3. Pole removals in conjunction with transformer removal
4. Replacing, removing and transferring service drops
5. Replacing or removing not more than 1,000 ft of wire
6. Miscellaneous rearrangement of pole and line hardware.

Account Distribution

Class Code	Account	Per Cent
1	761-32	70.2
2	768-11	1.1
2	768-21	2.9
2	771-11	0.6
8	354	1.6
8	355	1.9
8	359-1	2.2
9	354	5.7
9	355	6.0
9	359-1	7.8
		100.0

Job Type 8—Pole Replacement—No Transformers includes but not limited to:

Job Description
1. Replacing poles
2. Installing, removing or transferring service drops
3. Relocating or replacing miscellaneous line devices and transferring minor items of pole hardware.

Account Distribution

Class Code	Account	Per Cent
2	768-11	1.7
2	768-21	31.8
2	771-11	3.9
2	775-49	4.1
8	354	14.2
8	355	0.1
8	359-1	0.1
9	354	41.7
9	355	1.5
9	359-1	0.9
		100.0

Class code numbers in the above account distributions are machine designations used to identify charges to the account as either operations, maintenance, new construction or removal costs.

IBM on the Job

With this information it was possible to design a system for distributing labor charges on a 604 IBM calculator. For each job type, a set of labor distribution cards was key punched containing the accounts and related percentages for distributing labor. PGE has responsibility area accounting, so it was necessary to key punch a set of distribution cards for each responsibility area. The labor distribution cards for all job types and responsibility areas were merged in chronological order and referred to as the Master Labor Distribution File.

Key Punched Time Sheets

Now the line crews simply charge their time to the job order and job type numbers. The time sheets are key punched and each month summary cards are produced for all labor charged by responsibility areas and job types. The summarized labor cards are merged with the master labor distribution file and the 604 IBM calculator prepares labor distribution cards containing the computed labor charges and related accounting distribution for each job type.

Major jobs, or formal estimates, could not be classified by job types, since each provided for a specific installation not common to other jobs. However, by establishing a new account, Undistributed Construction Labor, the same method of distributing labor charges against formal work order estimates could be used as for distributing labor charges on job orders.

The labor distribution for formal work order estimates is determined by the engineering department when the estimate is prepared. For each estimate a set of labor distribution cards is key punched containing the accounts and related percentage distribution. These cards are filed in chronological order in the master labor distribution file used for job orders.

Charges Summarized

The line crews charge all time spent on formal work order estimates to the Undistributed Construction Labor account. Each month the labor charges are summarized and distributed in the same manner as outlined for job orders.

This system has resulted in many benefits. It has substantially reduced key punching time in the machine room. Also, better accounting for labor charges is obtained on job orders and formal estimates. This system met with immediate success with the operating personnel, who always felt it was the line foreman's responsibility to install the materials and the accountant's responsibility to make the proper accounting.

Zoom-Zoom-Zoom

Savings and Operating Benefits with

RUBBER LEAD CABLE UNDERGROUND

C. B. ANDERSON, UNDERGROUND ENGINEER, CALIFORNIA ELECTRIC POWER COMPANY

• To consumers, cost and aesthetics might be listed as the most important aspects of residential underground systems.

• To the utility, cost, reliability and ease of operation are very important.

• Since cost is of common interest, the following comments on cable design and application might offer these benefits.

The use of rubber insulated lead sheathed cables is, of course, not new. The Underwriters' Laboratories specifications for type RL are in the realm of being historic. One large New England company has been using this construction for at least 25 years in underground ducts for 600-v networks as well as for 5-kv primaries. Several utilities are now using it up to 15 kv.

Lead sheathed rubber insulated cables may be compared with the following contemporary types of construction.

1. Lead sheathed paper insulated
2. Nonmetallic sheathed rubber insulated
3. Metallic and nonmetallic sheathed polyethylene
4. Rubber insulated with concentric neutral wire

Lead sheathed paper insulated cables are very satisfactory when installed by properly trained underground crews. However, such crews are not usually available in remote service areas. Therefore, construction using sealing methods other than lead wiping are necessary. The difficulties encountered in this type of construction have led to the general popularity of cables other than lead sheathed paper.

Nonmetallic sheathed, shielded, ozone resistant, rubber insulated cables are readily handled in most instances and, therefore, have been used to a large extent for the lower distribution voltages. Construction of such cables has progressed to a point that many earlier installations of oil base rubber cables with impregnated fabric sheaths are now being replaced with oil base rubber cables of better quality. In many instances, cables of higher thermal capacity employing butyl insulations have been used. These cables may have a neoprene sheath or a polyethylene sheath, which is superior in most characteristics to neoprene.

This establishes a trend toward the acceptability of rubber-insulated cables, if they are properly constructed. They should provide shielding; adequate physical and electrical characteristics; a sheath that is resistant to abrasion and moisture absorption; and should be economical.

Advantages

At California Electric Power Co. commercially pure lead sheath, ozone resistant butyl rubber insulated cables have proved to be very successful in residential areas, based on initial use of about 100,000 ft. Advantages found are listed in the following paragraphs.

Single Conductor Shielded Cable Cost Comparison . . . Per Amp . . . 5-Kv Ungrounded
(Excluding installation costs)

Size-Insulation-Sheath	Insulation Inches	Sheath Inches	Approx O D Inches	Net Wt Lb/M ft*	Three 1/c Circuit Ft Price $ Per M Ft	Approx Current Carrying Capacity Amp**	Relative Cost $ Per 1,000 Ft Per Amp***
No. 6—Rubber-lead	**10/64**	**4/64**	**0.67**	**2,340**	**$ 960**	**86**	**11.2**
No. 6—Rubber-polyethylene	10/64	4/64	0.74	975	1,320	86	15.3
No. 6—Rubber-neoprene	10/64	4/64	0.74	975	1,410	86	16.4
No. 2—Rubber-lead	**10/64**	**4/64**	**0.78**	**3,180**	**1,350**	**147**	**9.2**
No. 2—Rubber-polyethylene	10/64	4/64	0.85	1,515	2,100	147	14.3
No. 2—Rubber-neoprene	10/64	4/64	0.85	1,515	2,220	147	15.1
No. 2/0—Rubber-lead	**10/64**	**5/64**	**0.94**	**4,980**	**1,830**	**218**	**8.4**
No. 2/0—Rubber-polyethylene	10/64	5/64	1.01	2,430	2,940	218	13.5
No. 2/0—Rubber-neoprene	10/64	5/64	1.01	2,430	3,060	218	14.0
No. 4/0—Rubber-lead	**10/64**	**5/64**	**1.05**	**6,270**	**2,460**	**286**	**8.6**
No. 4/0—Rubber-polyethylene	10/64	5/64	1.11	3,315	3,690	286	12.9
No. 4/0—Rubber-neoprene	10/64	5/64	1.11	3,315	3,840	286	13.4
500 mcm—Rubber-lead	11/64	**6/64**	**1.39**	**11,640**	**4,320**	**466**	**9.3**
500 mcm—Rubber-polyethylene	11/64	6/64	1.46	6,690	6,720	466	14.4
500 mcm—Rubber-neoprene	11/64	6/64	1.46	6,690	6,990	466	15.0

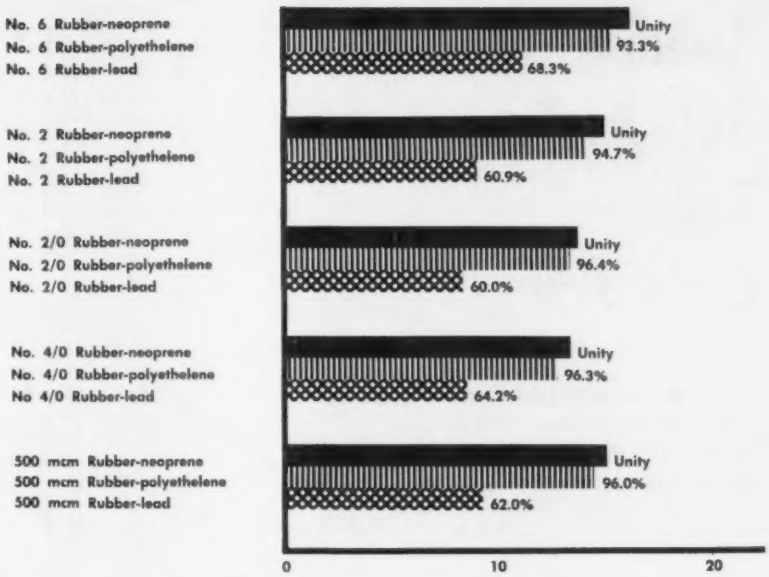
* These are the approximate weights per M ft for three 1/c cables
** Three 1/c cables in one duct; 100% lf; ambient earth temperature 20 C
*** Cost to carry 1 amp 1,000 ft, assuming each cable carries full capacity current

Manufacturing Advantages

• Application of the lead sheath eliminates the costly steps in applying a shielding tape, bedding tapes and the subsequent application of an over-all nonmetallic sheath.

• When compared with nonmetallic sheaths, which require vulcanizing, the use of lead eliminates a second vulcanizing and therefore less initial or factory aging of the insulating rubber compound. A second vulcanizing of rubber compounds has been known to increase the factory test failure rate about 3%.

• Those manufacturers who presently cure their neoprene sheaths under a coating of lead (lead curing) can show an additional saving as they do not have to go through the process of coating the cable with curing lead and then stripping it off.



Relative Cost Per 1,000 Circuit Feet Per Amp (Dollars)

Single conductor shielded cable cost comparison . . . per amp (excluding installation cost)

Operating Advantages

• Insulation shielding frequently is important, so it is desirable to compare some of the relative merits of the lead sheath with tapes.

• The tubular construction provided by a lead sheath is more desirable than spirally applied overlapping or intercalated tapes. Resistance of the latter two regular types is somewhat high at surge frequencies because of the combined effect of high reactance due to spirality and contact resistance. Resistance of the intercalated tape construction is lower than spirally applied tapes at surge frequencies, but the inductive reactance is high.

As the tubular sheath constructions have lower resistance and inductance, incoming wave fronts are reduced, thereby improving the cable's performance under surge conditions.

• Another advantage of this tubular sheath is that it approximates a truly impervious sheath. No metallic sheath can approach lead's resistance to moisture; it resists most types of corrosion and gives very good protection to the underlying rubber insulation from oils, gasoline, etc.

• Fault locating on a lead sheathed cable is simple when compared with one of the nonmetallic sheathed shielded types.

Assume d-c impulse equipment is used to locate a fault. When a failure from conductor to shield occurs, which is of such a degree that the sheath is not ruptured, such a fault is very difficult to locate as the noise of impulse is minimized by the nonruptured jacket.

Pickup coils are generally inoperative on nonmetallic sheathed, shielded cables.

Occasionally the breakdown will show up at a point several hundred feet distant at a loose shield ground connection.

A bare lead sheathed cable allows much more specific location. Pickup coils may be used to determine test current magnitude and direction, thereby allowing rapid fault location.

• A trend toward use of nonencased ducts and even nonduct lay cables affords the possibility of "in place" cable repair rather than complete replacement.

• At first thought, it might seem that the weight of lead sheathed cables might be a disadvantage. However, since most companies already have mechanical equipment for handling heavy cables, this weight should not be a problem. It might also be pointed out that in many cases longer lengths of this type of cable are available since no vulcanization of the sheath is required.

Cost Advantages

• In order to compare costs, the relationship of relative cost per 1,000 ft/amp was used. Three constructions were considered: rubber lead, rubber-polyethylene and rubber-neoprene in five different sizes from No. 6 AWG to 500 mcm. The latter two employed shielding tapes. The conditions assumed were three single-conductor cables per duct, 100% load factor, with each cable carrying full capacity current. Installation costs were excluded. The resultant figures show that the ratio of relative cost per 1,000 ft/amp remains approximately the same for each type of cable regardless of size.

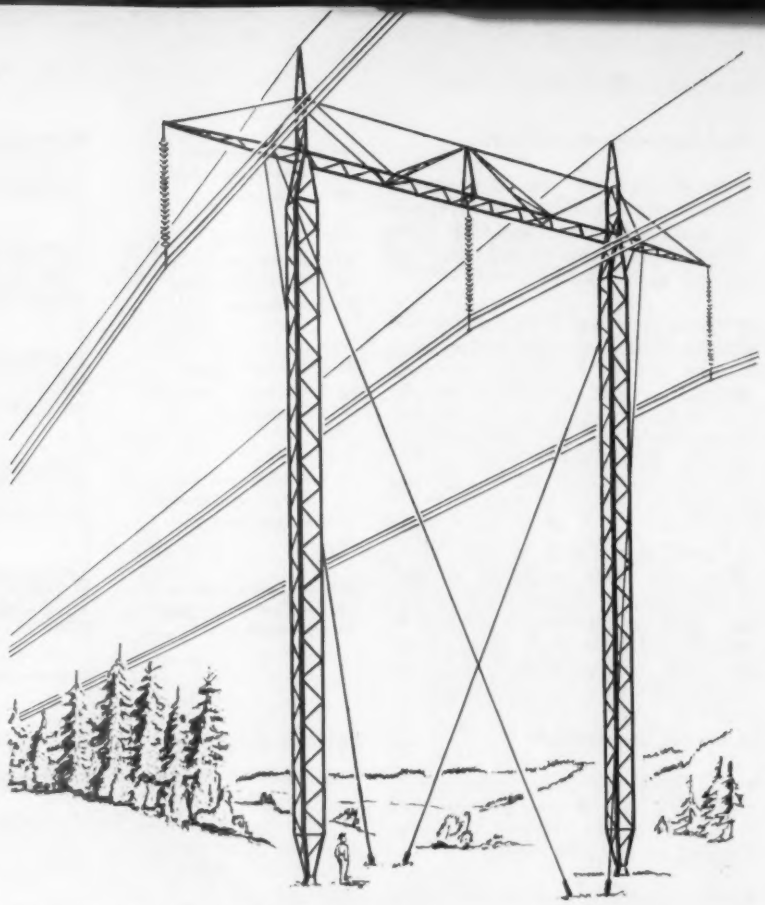
It should be noted that these considerations are based on using a nonprotected lead sheathed cable. Fortunately, in many parts of the West, corrosion is not a severe problem. These costs were developed exclusive of installation since in practice the particular residential circuits considered were joined and terminated with self-vulcanizing rubber tapes, protective tapes and other materials normally used when handling the nonmetallic sheathed cables.

Residential feeders generally do not experience loading that dictates use of underground structures different from those common to nonmetallic sheathed cables; therefore, sheath fatigure is seldom found to be a problem.

Along with the better operating and cost benefits of lead sheathed rubber cables comes a higher degree of safety, which is so important in residential areas. All this at a reduction in cost to the utility and the consumer.

Swedish 380 Kv Tower Reduces Costs 31%

O. D. ZETTERHOLM, CHIEF ENGINEER
L. O. BERG, DIVISIONAL CHIEF
SWEDISH STATE POWER BOARD
STOCKHOLM



Artist's drawing shows simplicity of guyed tower construction. Less material, smaller foundations, standardized components, three conductors contribute to big savings

Sweden's power supply is based mainly on hydroelectric power. Since most of the power is generated in northern Sweden, while the bulk of the consumption takes place in the southern part of the country, a large part of the power has to be transmitted over very long distances. On an average it may be said that the distance from the center of the power-producing regions to the center of consumption is 450-500 miles. In order to make economical transmission possible over these long distances very high voltages must be used. Thus Sweden was the first country to build a 380-kv transmission line, the so-called Harspranget line, which has a length of about 600 miles and came into use in 1951. Further building of 380-kv transmission lines has taken place since then as the need has arisen. On Oct. 1, 1959, the total length of these lines was 1,950 miles and recently the construction of a further 620 miles has been started.

In planning the new lines the transmission capacity requirements were greater than with earlier lines. In view of the fact that a 380-kv network already existed, it was scarcely economical to adopt even higher voltages. The better solution was to increase the cross section of the conductors. Consideration was also given to the possibility of increasing the transmission capacity by introducing series capacitors on the transmission lines.

The 380-kv transmission lines built previously were equipped with *twin* conductors each of 593 mm² steel-aluminum (650,000 cir mil). The towers are of H-type, in steel, this having proved most advantageous for Swedish conditions (see Cigre report 1954 No. 203). Both tower legs are inserted in the ground and each is laid on its own foundation of impregnated wooden sleepers held together by steel beams.

For the new transmission lines it has been decided that the phase shall consist of *three* conductors of the type mentioned above. The mechanical load on the pylons will increase so much in consequence of this that it is not economically desirable to develop the old type of pylon, partly because the foundations would become disproportionately large. It has instead been decided to go over to a guyed type of tower, as in this way the foundations can be kept small and the legs light.

Guyed Construction

As shown in the illustration, the pylon is stayed by four guys so arranged that only two anchorages are required. The anchorages are placed in the center line of the tower, one on each side of the latter and at such a distance from it that the guy will also be operative for forces in the direction of the line. In Finland, and in later years in Russia also, towers with a similar guy arrangement have been used, but these towers have had guys fastened to the leg at the crossarm and sloping legs; as a result it has been necessary also to have sloping foundations. In view of the work involved in building the foundation and raising the pylon we have considered it to be a great advantage to have the legs vertical. It has been possible to arrange this by placing the guy attachments on the crossarm outside the tower legs. It is true that this places a greater load on the crossarm, but it has been possible to keep the phase distance small and so the crossarm has not become too heavy.

Like the tower used earlier, the new tower is intended for a normal span of 1,080 ft and a normal height from ground to crossarm of 72 ft. In spite of the fact that this new type is intended for three wires per phase against only two earlier, the average tower weight will be lower, i.e., 18.1 tons/km of line against 26.6 tons/km earlier and the tower costs have been diminished by about 31%.

In order to meet the needs at the individual tower sites the types of

legs are made in length groups ranging in steps 27.5 in. from 58 ft to 104 ft. The section of the leg has been made square, the frame bars being made of angle steel 70.70.7 in a quality with a breaking limit of 52 kg/mm². For the diagonals, where the strain is very small, we have used angle steel 40.40.4, the smallest dimension that could be used having regard to the necessity of finding room for ½-in. bolts. The quality of the material in the diagonals is considerably less expensive than in the frame bars. The conical upper and lower parts of the legs consist of special elements that are bolted to the legs, which in turn is divided into two or, in the higher pylons, three sections.

Legs Standardized

In designing the legs, special attention has been paid to making them suitable for standardized mass production. All the diagonals—estimated to number 750,000 on the 620-mile transmission line which has now been begun—are therefore exactly alike. For the frame-bars, seven different lengths have been standardized and, by combination of these, 21 different lengths can be obtained in the legs.

In designing the crossarms, much work has been done in order to get a light but at the same time strong construction, which will be able to take up the vertical forces from the conductors and the conductors break forces while at the same time it is affected by the very large forces from the guys. The horizontal lower frame is made of two U-beams with bolted diagonals of angle steel. The other parts are made of angle steel. By using welding to a certain extent on the details in the crossarms, it has been possible to keep their weight low; the whole weight of a normal crossarm is only 4,500 lb.

As mentioned above, the foundations for the tower can be made small because they are subjected only to compression. The smallest foundation, used in good ground, rests on a grillage consisting of four sleepers with a length of 51 in.

Normally the lower edge of the foundation is placed 4.3 ft under the surface, but in frost-breaking ground the excavation depth is increased to 5 ft.

An important element in the new tower consists of the stays and the stay anchorages. Traditionally, guys are used a great deal in Sweden in the building of transmission lines, especially where wooden poles are used. In order to take up the angle forces, guys have been used also for all kinds of steel towers in transmission lines. The question arises whether it is desirable in transmission lines as important as the 380-kv lines are to make all towers entirely dependent on guys for their strength. Many people consider that guys are more sensitive to damage than other parts of the towers. This, however, is contradicted by experience. Swedish systems have had very good operational results from guys and have therefore not hesitated to use them to the extent required by the new type of tower.

The force which in unfavorable conditions may arise in the guys amounts to 55,125 lb. Therefore each of the four guys consists of a double .294-in.² guy wire with a breaking strength of 199,000 lb/in. By using double stay wires the advantage is attained that the wire need not be cut for fastening in the crossarm but can be laid over a curved beam in the latter. The attachment of the double stays to the stay foundation is done by making fast the ends of the wires with wedges in a common device fitted with screws by means of which the tension in the stay can be adjusted. The stay foundation consists, like other foundations, of a grillage consisting of seven sleepers 102 in. long and held together by a steel beam.

The three conductors per phase form an equilateral triangle with sides of 450 mm and with the apex turned downward.

In order to prevent contact between the conductors in the same phase, spacers are fitted as follows:

Span	425- 855 ft	—1 spacer
Span	855-1,280 ft	—2 spacers
Span	1,280-1,475 ft	—3 spacers
Span	1,475-1,640 ft	—4 spacers
Span	1,640-1,800 ft	—5 spacers
Span	1,800 ft up	—6 spacers

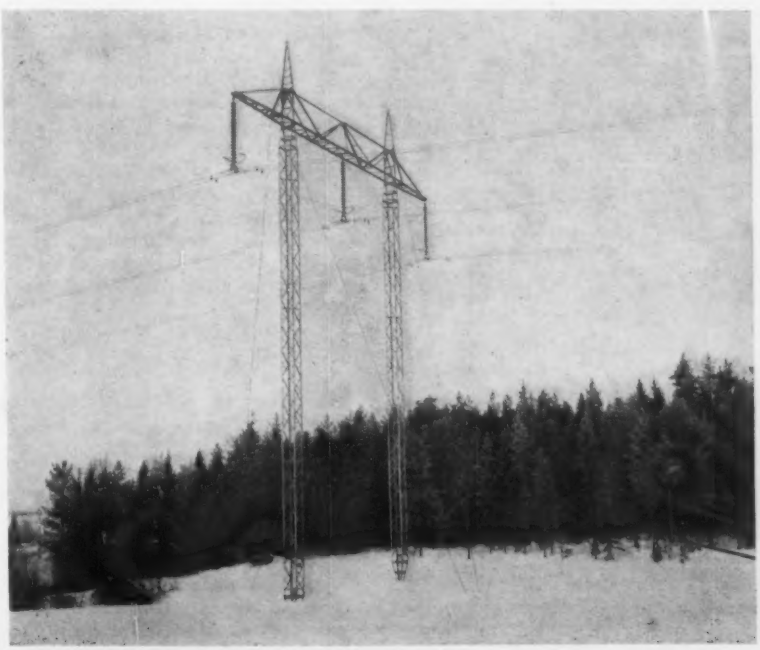
The spacer planned to be used consists of three clamps freely connected with a triangular frame. Changes between the wires are taken up at each clamp by two joints set at right angles to each other. These joints are spring-loaded in order to prevent wear. The clamps are made with a wide radius to prevent fatigue breaks in the wires.

The new transmission lines are isolated for a withstand tension in rain of 1,275 kv and a one-minute withstand tension in rain of 640 kv.

The insulator strings are fitted with a lower grading ring and also have an upper arcing horn. In the standard string there are 17 insulators with a spacing of 6.7 in.

For the new 380-kv transmission lines with three conductors per phase, insulators with working loads of 15,400 and 22,050 lb have been evolved, and as a result nearly all strings are now single. Apart from these, insulators with working loads of 10,000 and 12,100 lb are used.

A straight-line tower of the new stayed type used for getting experience on a twin-conductor line that is already in operation, forerunner of three-conductor design



We have just begun in our use of . . .

UTILITY RADIO SYSTEMS

HAROLD BACKEN JR., MANAGER, DOUGLAS ELECTRIC COOPERATIVE INC., ROSEBURG, ORE.

• The future use of radio by power utilities is unlimited. Present developments and research now under way will provide for uses that presently would seem fantastic.

• To conserve spectrum space and on the air time, a gradual transition from voice communication to pulse transmission or coded tones will occur.

• Communication systems for utilities must share more in the general system planning in the future. More and more reliability will be required.

Of the many proposed uses for radio in public utility systems, the following possibilities appear to offer the most promise.

1. The operation of hydrogenerating stations by use of closed circuit industrial TV, transmitted to a central point via microwave. This is now in use by Southern California Edison Co.

2. Slow-scan video transmitted over microwave for meter reading. This is now being done very successfully by the Idaho Power Co. to obtain periodic readings of the power interchange with Bonneville Power Administration at La Grande, Ore.

3. The use of facsimile for utility operation. This could possibly be used to give connect or disconnect orders to a crew or serviceman so there would be no possibility of misunderstanding.

4. There will probably be a more widespread use of the instrument now on the market for surveying, using a two-station microwave system. This equipment will measure distances from 250 ft to 50 miles with accuracy to within one inch.

5. Automatic reading of consumers' meters by use of radio.

6. The further application of the new G-line system for microwave, which makes it possible to put microwave directly on one-phase wire of a transmission line and carry it for great distances.

7. Forward scatter, which will give reliable communications over many hundreds of miles at UHF and VHF frequencies.

8. Data processing. Microwave may be used to transmit data to processing centers and to return the desired answers or statistics.

Crowded Bands

Operators of utility radio systems are familiar with the congestion in the frequency bands, and the necessity to "stack" licensees on top of each other on the same frequency. In the United States, there are some 24,000 utilities that are eligible in the power radio service. With less than half of these licensed, what would the air be like if some morning all licensees would be on the air? Surely many of the utility communication systems would be useless.

Technical advances have made possible more and more use of our assigned spectrum space through split channels and narrow band operations, and further advances in this area are expected, but it will not be sufficient.

In present utility radio operations, the use of voice is depended upon primarily for the exchange of intelligence. Voice transmission is very wasteful of spectrum space and is considered a most inefficient method.

Coded Tones

In the future, we shall see a gradual transition to the use of coded tones in the utility radio field. In fact, some use has already been made of this in the outage locator that is on the market. However, changes in the FCC rules will be necessary before any wholesale use of tone signaling can be made.

Some of the operations that might be performed from a central location by the use of tone signaling might be:

1. The control of off-peak loads—turning them off or on at will.

2. Substation alarm indicators to indicate high temperature of equipment, switching operations or the presence of grounds or other abnormal conditions in the station.

3. The supervision and control of pole-top switches.

4. The control of capacitor banks.

5. Phase identification which could be accomplished by comparing the phase of the power line conductors with a phase identification tone transmitted by a base station.

Planning

When looking into the future, how well are utility communications systems planned? Is the planning of communications systems as thorough and as complete as utility transmission lines, generating plants or distribution systems? Suppose we compare the protection used on 60-cycle electrical equipment with that used on communications equipment and circuits. The 60-cycle equipment is characterized by back-up protection on top of back-up protection. If one relay fails, there are several others to take over and do the job of the one that failed. We have automatic sectionalizing, automatic transfer, distribution reclosures, three-shot fuses, bus tie circuit breakers and many other items, all designed to minimize service outages. However, planning for uninterrupted communication circuits is not to this scale. In communications, the minimum equipment is generally used to do our communications job.

Greater Reliability

For the future, it is obvious that the reliability of utility communication systems will have to measure up to the reliability expected of the entire power system.

W. C. Ferris shows how to tack up cable on dry wall while N. L. Willard assists

Moderators — E. H. Pemberton, Southern Colorado Power; Everett Chesney, Yampa Valley Electric Assn.; Richard Rose, Morgan County Rural Electric Assn.

ELECTRIC HEAT WORKSHOP

"Electric Heat Is Yours in Colorado" was more than just the title of an attractive brochure put out by the Colorado Farm Power Council. It was the theme of a dynamic, fact-packed, two-day electric heating workshop held at Continental Denver Motor Hotel Sept. 8 and 9. Colorado State University co-sponsored the meeting.

Its "faculty" included most of the national speakers at the first National Electric House Heating Symposium in Chicago last March, which inspired the Colorado workshop. As in Chicago, it was supported by a manufacturers' exhibit displaying a wide variety of makes and models of electric heating equipment for home and commercial applications.

The four sessions were moderated in turn by E. H. Pemberton, Southern Colorado Power Co., Pueblo; Richard Rose, Morgan County Rural Electric Assn., Ft. Morgan; N. A. Evans, Colorado State University, Ft. Collins; and Everett Chesney, Yampa Valley Electric Assn., Steamboat Springs.

Attendance packed the 200-seating capacity of the hotel and included an excellent cross-section of electrical contractors, architects, consulting engineers, electric heating suppliers and utility people. Surprisingly high enthusiasm for the potential for electric heating characterized the meeting.

The program was arranged not only to discuss the market possibilities and the selling methods but to hit all of the fundamentals such as insulation, ventilation and humidity control, calculations, temperature control and wiring and code requirements.

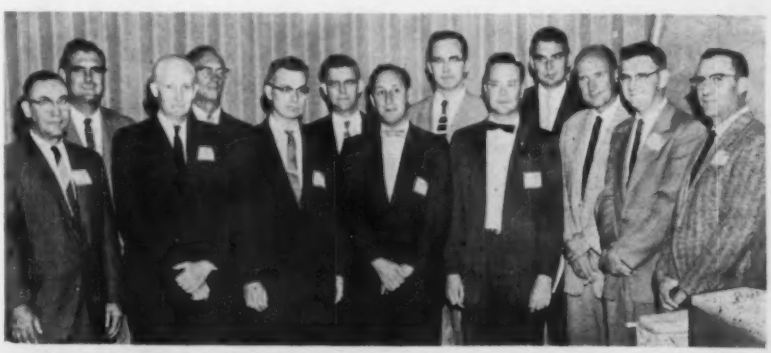
Use of the new brochure by everyone as a sales tool was urged by Pemberton to open the meeting and again by Ed W. Gaither, president of the council, San Isabel Electric Assn. Gaither also announced a lighting school, "The Lighting Academy," to be sponsored by the council Dec. 1 and 2 in Denver.

That " electric heat is here" S. B. Aronson, sales manager of Berko, New York, declared and Colorado is in the first stage in its "battle for fuels." However, air conditioning summer peaks have made the market more favorable. He declared specialty package selling would be needed since the electric heat could not be sold like lock nuts and bushings by contractors. That was too difficult and the need was to make it easy to buy.

Pemberton spiked a power cost complaint by declaring that more effect would be made on the rate by the load factor than anything else and it was up to the heating industry to make electric heating a good load factor.

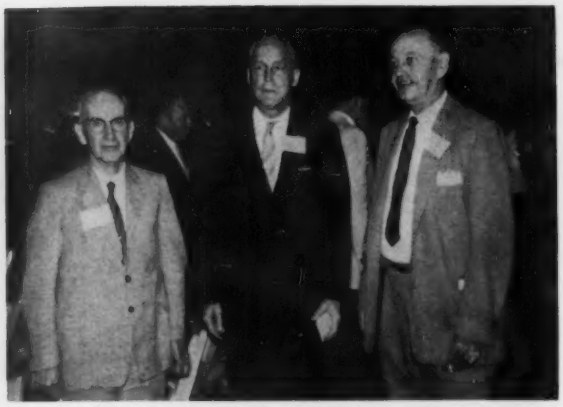
Two forceful speakers on the value of insulation were G. A. Erickson of Wood Conversion Co., Cloquet, Minn., and very successful heating salesman F. D. Olson, president, Solar Electric Heat & Insulation Co.,

Continued on p 88



"Faculty" of the Electric Heating Workshop—Olson, Graham, Luscombe, Smith, Briggs, Erickson, Aronson, Boyd, Williams, Zabella, Willard, Wadleigh and Ferris

Sisson Trips Chairman — **Baker** Oregon Chapter — **Marqueling** General Chairman



Going Retired — **Brandon** UL — **Klawa** Oregon State Inspector

INSPECTORS MEET AT PORTLAND AND RENO

Although sections of the code debated at the Northwestern and Southwestern sections' annual meetings differed, the major topic at each concerned paths for return circuits. Both annual meetings featured code discussions and code change proposals almost to the exclusion of other programs and both had record attendance. Northwestern Section, International Assn. of Electrical Inspectors, at Portland registered 227 men, 108 women, largest in history. Southwestern Section at Reno registered 176 men, 82 women, more than at Santa Rosa last year.

Other similarities were addresses by Peter J. Hicks Jr., IAEI president, Providence, R. I.; Everett F. Cogan, IAEI secretary-treasurer, Chicago; Frank Stetka, NFPA, Chicago; a report by H. P. Michener for NEMA on the technical subcommittee studying disconnecting means for three-phase motors; a report by H. H. Watson, General Electric Co., Bridgeport, on the NFPA committee on mobile homes and trailers with recommendations for wiring.

Each, likewise, had a presentation on behalf both of inherent or thermostatic built-in fluorescent ballast protection by George E. Pieper of Metals & Controls Division, Texas Instruments, countered by a talk on fuse protection for ballasts in Portland by R. R. Harlow, General Electric, and in Reno by A. E. Rowe of the same company, Los Angeles.

"Like a fine jet airliner tuned to perfection, this 34th annual meeting of the Northwestern Section took off and got under way starting at 9 o'clock in the City of Roses," said James Backenstos, vice chairman of the Oregon Chapter, who was our reporter for the meeting. Unfortunately, however, the pilot, Joe F. Gray, Portland chief inspector, president of the section, because of a recent illness, could not take command. Instead Edward M. Tubbs, Bellingham chief inspector, first vice president, co-piloted after General Chairman H. E. Marqueling, Oregon Fire Insurance Rating Bureau, engineered it off the ground.

Encouraged by the progress of IAEI during the current year, President Hicks, in his address to both meetings, made a plea that inspectors develop a program better to qualify themselves for the administration and functioning of truly professional inspection service. "It has been said that those who cannot do, teach. It may now be said that those who can no longer do or teach, inspect buildings and installations. This, of course, should not be the case. Trade licenses and experience gained as a tradesman are not suitable qualifications for this type of work or its decisions, reports and the judgment required of inspectors." Through the IAEI and the industry working together he felt that in the future the status and standing in his community of the inspector would improve and his compensation be commensurate with his ability and responsibility.

Everett Cogan's report of the association's business showed the organization on a far better financial footing, with membership of 8,400 despite increases in dues. He urged members to contact delinquents and cited instances where this had yielded many returns.

Trailer Committee Report

Good news was contained in H. H. Watson's report of the NFPA trailer committee. Although not complete, stricter trailer court wiring standards and trailer service entrance requirements will be added to the 1962 National Electrical Code, he said. With appliance use in trailers used as permanent homes, branch circuits and feeders are not of sufficient size at the present time. Two ratings of power supply would be used—115 v, 30 amp, and 230 v, 50 amp.

Work is being done to standardize receptacles for connections. Demand load will be figured according to the code and a 100-amp service required where electric heat is installed in the trailer unit. In such case two supply cords of 50 amp, four wire, to provide for a grounding wire will be required. These must not be interconnected on the supply side but must feed two separate 50-amp distribution systems which are not to be paralleled. The grounding means, however, may be interconnected. To Chris Klawa, assistant chief electrical inspector of Oregon, who said that many trailers have 150-amp or more of connected load, Watson stated that anything beyond the minimum requirements would call for a larger service entrance. These

standards in some detail will be published later.

Most important code changes suggested in the code discussion were in Art. 200 regarding circuit identification. Among these the most important was a proposal to 200-6 (d): "Where two or more different systems (voltage and/or transformers) are installed on the same premises, the neutral with the higher voltage to ground (or from different transformers) shall be identified by a colored stripe in the white or natural gray conductor, each such additional system shall have a different colored stripe to assure that the neutral conductor is properly connected." In the same proposal it was asked that on a four-wire, delta-connected secondary, the phase conductor having the higher voltage to ground be identified by the color red.

Other recommendations for changes were for better identification of the grounding type attachment plug terminals. A more definite color code was also requested for all multi-wire branch circuits and two-wire branch circuits connected to the same system. Grounding type outlets were also asked for, not only for kitchens but bathrooms as well as laundry rooms, basements, cellars, workshops, etc.

As pointed out by Roger Niedermeyer, Portland assistant chief inspector, in the very section where the convention was held (the Lloyd Center), one of the largest in the world, transformers are scattered over the entire project. "It is important that we get each neutral back to its own transformer without benefit of using conduits, water pipe and metal building structure as a circuit conductor," he said. This was done in this project. The 277-v neutrals are identified with a colored stripe and the 120-v neutrals with the conventional white. If more than one transformer is used having the same secondary voltage, stripes of different colors could be used to associate it with its proper transformer.

Pieper
Texas Instruments

Michener
NEMA

Gaffney
Secretary-Treasurer

Tubbs
1st Vice President

Highlight talk of the meeting was given by A. J. "Sam" Rosch, former consulting engineer, Anaconda Wire & Cable Co., who spoke on ambient temperatures in relation to conductors in a raceway. He stressed the importance of the multiplying factors in the code tables. He said that if no consideration is given to voltage drop this can become a hazard. Particularly he referred to the skin effect on large size conductors where alternating currents tend to avoid the central portion of the conductor and confine themselves mainly to the outer skin. This skin effect becomes more pronounced as frequency is increased.

In the talks on ballast protection by Pieper for thermal inherent protection and the General Electric speakers for fuse protection, the main point of difference seems to have been this: Fuse protection upon ballast or capacitor failure will take the ballast off the line when the fuse blows and will not recycle. On the other hand, the thermal protector when the ballast has cooled down may recycle and thus reheat. However, Pieper pointed out, the temperature limit at which the thermal device is set precludes the heat from reaching a dangerous degree and recycling only calls attention to the fact that the ballast needs to be changed.

At the election of officers Edward M. Tubbs was made president, Eldon Shirley of Billings, Mont., first vice president; Loren Christensen, Salt Lake City, second vice president; W. L. Gaffney of Tacoma, retired, was re-elected secretary-treasurer, and the executive committee consists of Mark Lundy, Boise; R. M. Countryman, Spokane; James Backenstos, Portland; J. D. Gawne, Seattle City Light; J. Hyde Stayner, Utah Power & Light; T. M. Widrig, General Electric, Seattle; B. A.

Bissett
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Panel on Busways—O. G. Wedekind, UL; L. O. Trim, moderator; E. E. Carlton, inspector; E. G. Brolin, manufacturer; H. K. Glenn, utility; K. P. Stiner, manufacturer

Travis, consulting engineer, Seattle; and Past President Joe Gray. Cliff Atkins is the executive council member who is candidate for second vice president of the IAEI, and Hal Morr, Salt Lake City, the other member. Alternates are Chris Klawa, Edward Tubbs and Mark Lundy. The 1961 annual meeting will be held in Boise, probably Sept. 11-13.

Southwestern Section

The Southwestern Section meeting was under the efficient management of President Ernest Nelson, inspector, San Leandro, and Secretary-Treasurer Lou La Fehr of Alhambra. In addition to the addresses of the national officers mentioned previously and the reports of Watson, Michener and the discussion on ballasts, H. G. Ufer presented an inspiring message to electrical inspectors, reminding them of their public responsibility and the need to raise their standards to merit the prestige that they wish to have in their communities.

At one of the luncheons K. W. Swain, chief engineer, Chase-Shawmut Co., presented a paper previously given at Eastern meetings relating to the interrupting capacity required on some modern systems and the type of fusing that can take care of such interruptions. Another speaker, Comdr. B. R. Van Buskirk, U. S. Navy, retired, gave a graphic picture of some of the indecencies and tribulations of being a prisoner of war but did so with a sense of humor.

On the final morning Dr. William A. Nielander, Arizona State University, Tempe, gave a down-to-earth and practical talk on the public relations problems of an electrical inspector and how to prepare to meet them.

Code proposals in the Southwestern Section emanate from workshops. This plan has been followed for the past several years. The group breaks up into three workshops, one on residential, another commercial and the third industrial portions of the code. For a full day and a half they review the proposals submitted by members for changes, discuss them at length and come up with definite recommendations for code changes which are then presented to the general meeting at the final session. These then are voted upon and either accepted to be sent through channels to the code panels or rejected.

In all three the chief topic was a proposal by the Northern California Chapter covering a number of code changes recommended in view of the growing use of nonmetallic piping systems for water, thus defeating the traditional means for grounding of all-electric systems. (Previous issues of ELECTRICAL WEST have carried the recommendations of the inspectors.) After considerable analysis of every detail of these proposals they were voted to be passed to the code committees intact. In general the proposal would require all piping systems and the metal frame of the building to be bonded to the service ground and that driven ground supplement water pipe grounds because changes in water systems may

Arthur Vesco, San Diego, new president, IAEI, Southwestern Section; Walter Reed, Orange County, new third vice-president

render water piping system grounds useless in the future.

Other proposals asked the code committees to define requirements in the installation of new plastic conduits and likewise define more clearly where cable trays can be used and under what conditions.

The residential code shop chairman was Robert Fassbender, Arizona Public Service, and C. R. Pierce was secretary. Clyde Narvaez was chairman of the commercial code shop, Richmond, and R. D. Johansen of Alameda, secretary. L. O. Trim, Burbank, was industrial code shop chairman and A. W. Pollock, Santa Monica, secretary.

A diversion from the industrial code shop patter was a panel discussion on business for service. L. O. Trim acted as moderator. E. E. Carlton represented the inspectors; O. G. Wedekind, Underwriters' Laboratories; H. K. Glenn, utilities; Kent P. Stiner and E. G. Brolin, manufacturers' viewpoint. The topic was whether ventilated bus duct could be used outdoors for service without further protection.

There was a question raised whether the code workshop plan would be continued but after debate it was agreed to continue it, with some improvements in the manner of handling it. An important announcement was made that the educational committee of the section was just about ready to turn over to the secretary-treasurer the complete manuscript for the training course for electrical inspectors which it has been preparing for two years. When it is completed it will be available to chapters through the secretary to be put on with the aid of local educational facilities.

Officers elected for the next year are Arthur P. Vesco, San Diego chief inspector, president; Charles R. Pierce, Fresno chief inspector, first vice president; Paul Davison, Mesa, Ariz., second vice president; and Walter Reed, Orange County building inspector, third vice president; L. E. La Fehr, Alhambra, secretary-treasurer. Representatives on the executive council will be E. E. Carlton who is candidate for first vice president, IAEI, and A. C. Veit, Los Angeles County. Alternates are Barney Alverson and C. H. Hefner with the secretary as ex-officio member. All members of the executive committee were returned to office with the exception of Lester Woldit, who is about to retire. In his place Glenn S. Spears of Stockton was named. The next annual meeting will be held at Hotel Del Coronado, Coronado, Sept. 17-20, 1961.

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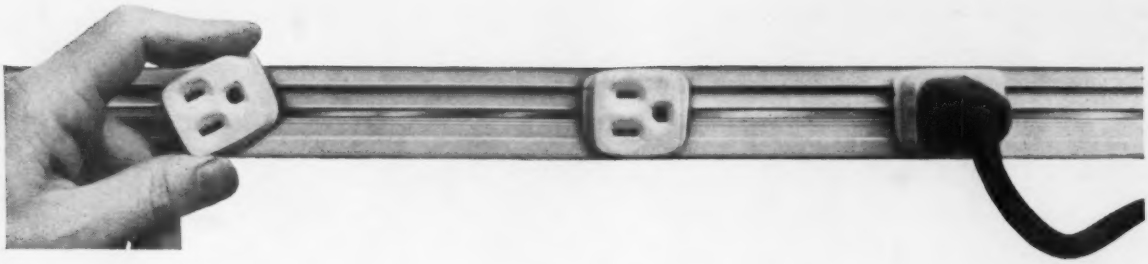

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CONTRACTING & CONSTRUCTION SECTION

STATISTICS / COSTS / PROPOSED PROJECTS / NEW PRODUCTS / NEWS

LATE NEWS FLASHES

Single Contract Under Fire

AGC Building Contractors Division at its convention in Phoenix Oct. 7 warned that the single contract method was under fire and that the fire was burning away some of the supports to its customary mode of operation. Its governing and advisory board reaffirmed support of joint industry procedure for receiving and handling sub bids, particularly where no present means such as bid depositories already exist and where the AIA will cooperate.

Will Put Up Plan Deposit

Puget Sound Chapter, NECA, has made arrangements to put up the deposit for plans so that its members will not need to do so individually. The chapter issues each architect, engineer and awarding authority in the Puget Sound area a certificate guaranteeing that the chapter will pay the deposit fee for plans and specifications that are lost, mutilated or not returned within the specified time.

NFPA Reports on Fire Losses

Defective or improperly used electrical wiring and equipment caused 122,900 fires, with losses totaling $193,220,000, according to the last fire loss report of the National Fire Protection Assn. Electrically caused fires by that rating were the third in the list of causes. Overheated cooking and heating equipment was the No. 1 cause. Careless smoking and disposal of matches was the second.

Rejects Bids

San Mateo City Council rejected all bids on a proposed police station and jail, after protects were made by the Sheet Metal Assn.

Continued on p 89

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100 PROPOSED WESTERN PROJECTS
97 READER SERVICE SECTION

Motors and Controls—XVI

THERMAL MEMORY

TOM HUGHES, ELECTRICAL SAFETY ENGINEER, CALIFORNIA DIVISION OF INDUSTRIAL SAFETY

Among the various losses in a motor (which contribute heat) the greatest is the I^2R or copper loss. For steady-state running (as with the blower or water pump) the heating in the motor is directly proportionate to the current being consumed. Thus, men who have spent a lifetime developing thermal overload relays will tell you that their relays present a facsimile of the conditions existing in the motor.

Most assuredly they can take a certain motor and (controlling its load conditions) apply the proper relay and prove their point. But they are choosing the circumstances to suit their demonstration. Everything is hunky-dory for steady operation under rated load, line voltage, ambient, ventilation and maintenance factor. But you see how many variables we have to name. Who can guarantee any of these factors to remain stable?

And, on the other hand, the whole set of conditions is meaningless when you get into frequent starting jobs. This is because of the property in your current-operated thermal relays which we shall call "thermal memory." The large starting-current boosts the heater and its bimetallic actuator up toward the tripping point. Then, before it can cool down to normal operating level, another slug of starting current hits it and boosts the temperature up a little higher. And you know the end result.

"Well," the salesman says, "you are doing the same thing to your motor winding and it will burn out if you don't take it off the line." But, patient reader, we spent several pages in this series proving that a normal motor produces intolerable hot spots on frequent starts and therefore must be replaced with a special motor designed for such duty.

Granted: the high reactance motor doesn't draw as much starting current and therefore doesn't get so hot and the thermal relay likewise would not get so hot. But anyway you figure it: if that relay is going to really shepherd that motor it has to stay up near its tripping point when that motor is at maximum safe operating temperature. Then any pulsations are just placing an unreasonable quality demand on that relay while a dashpot relay can do the job so effortlessly.

Well, suppose it does trip out on you! The manufacturer says he can help the situation by furnishing a relay which automatically resets itself. Again, we scream, "But tripping is a symptom of faulty application." We want a motor vs load setup that doesn't overheat and a protector that will only trip under abnormal circumstances.

However, that brings up a point. Let's take a better look at this automatic reset feature. From a design standpoint, this faculty must be associated with lighter contact pressure if the bimetallic unit is to have complete reversible control (which it didn't have in earlier days). Then, as the assembly approaches the critical temperature, any environmental vibration or shock can cause momentary breaking of the control circuit and nuisance drop-out of the controller.

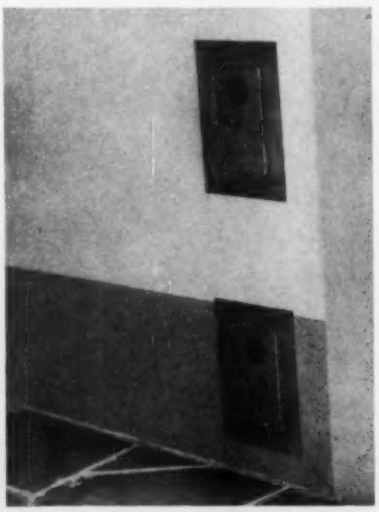
On the other hand, such a reversible action of the tripping device should only be used with a three-wire remote control push button station. If it is used with automatic controls such as pressure, temperature or float switches, it can produce recycling and overheating of the motor under abnormal conditions with no warning to persons in charge. Then there is the safety hazard of restarting equipment without warning while a person is investigating a shutdown.

Another, but less frequent, misapplication of thermal overload relays is teaming them with motors which have to overcome heavy inertia loads. In other words, the higher starting current is applied over a longer period and the relay heater has a chance to overshoot its operating level before settling down. Manufacturers can provide many means of varying the characteristics of relays to counteract most any of these drawbacks but you can't achieve the same degree of protection at near-peak operation of a motor if you put restraints on the protection.

Now we realize we have made a bad case for thermal relays. We have really borne down on their negative side. However, having spent many years in individual persuasion efforts, trying to overcome the inertia of owners, contractors, inspectors, etc., we have learned that we have to swing a long two-by-four to break through the complacency of the industry.

From the insurance claim adjuster on down to the inspectors, we are yelling our heads off about motors causing more electric fires than anything else. We make a guy put running protection on every motor but few of these authorities expend any effort to find out if we are accomplishing anything. But, in this series of articles we are trying to serve the fellow who has to pay the bill. If he is taken care of, the rest will have no worries.

The thermal relay is certainly the simplest and most foolproof protector if it is correctly suited for the particular motor and load. We just want proper consideration given to applications.



There is an invisible watchman to guard the corridors of the girls' dormitory at University of New Mexico in Albuquerque. Photoelectric cell units are mounted unobtrusively near the entrance to such corridors. Anything or anyone passing thus sounds a warning in the office from which the cause is investigated. The idea was that of consulting electrical engineer Carl Albach and is one of the many little refinements of the design

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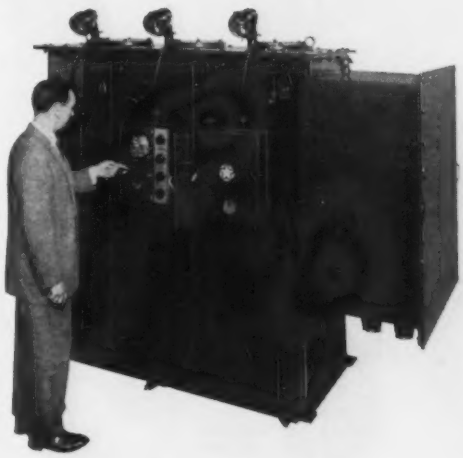

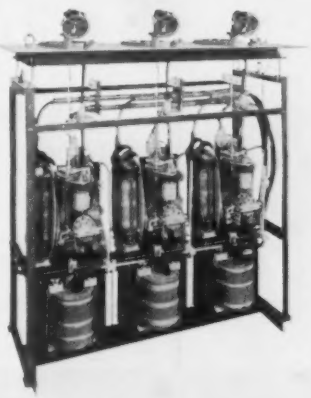

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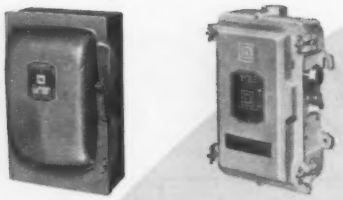
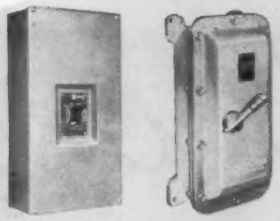
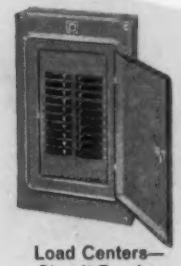


Safety Switches for Normal and Hazardous Locations



Industrial Circuit Breakers for Normal and Hazardous Locations



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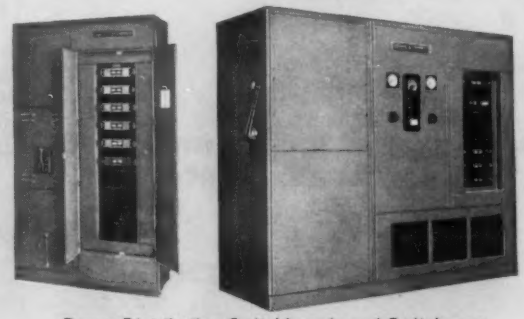
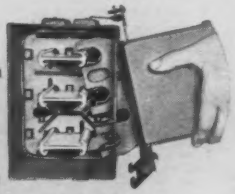
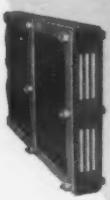


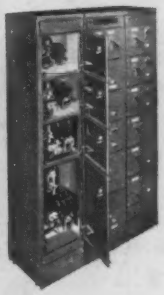
Power Distribution Switchboards and Switchgear



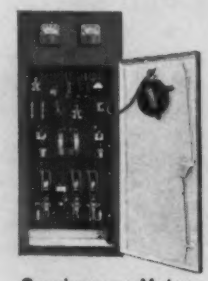
Plug-In Duct



Feed-In Duct



Motor Control Centers



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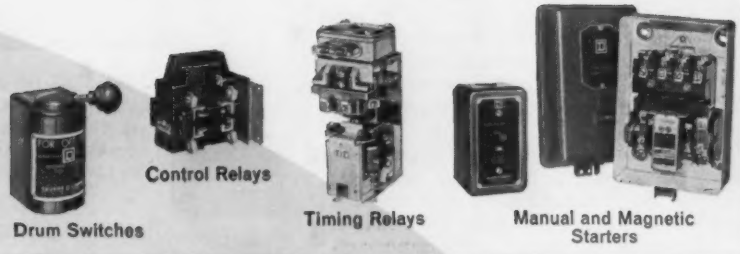

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Heat Workshop

Continued from p 77

Salt Lake City. Erickson showed preliminary results from some laboratory tests on two homes built in St. Paul where a 3,000 degree-day situation exists to test the value of insulation.

Olson, who has kept excellent records of installations he has made in the Salt Lake City area where a 5,800 degree-day situation exists, proved the rate is not important. "Almost any rate is acceptable if the house is well insulated," he said. The workmanship and installation of insulation, he declared, is as important as that of the electrical equipment. He thought the 6-4-2 ratio ridiculous. His figures showed that it paid to insulate far beyond this and that the insulation would more than be paid for in lower operating costs.

Robert Luscombe, discussing humidity control, declared electrically heated homes that generally held higher levels of humidity were well insulated.

Manufacturers of various types of equipment then described the differences between the various systems. Luis Zabala of Wesix described natural convection equipment; R. L. Briggs, Electromode, Rochester, forced air heating equipment; Jack Hughes, Fedders Corp., St. Louis, reverse cycle heat pumps; and Milton Keiner of Meier Electric, Indianapolis, radiant heating.

Importance of choosing the right kind of equipment for the right kind of place rather than attempting to make an installation completely with one kind was stressed by N. L. Willard of Ryall Electric Supply, Denver. "Don't get so dead set on any particular type or method that you can't see where the other has an application that may be better," he said. Quality and performance of the equipment were also stressed. He predicted a big market in the Mountain states if the industry did not price itself out of the market or make it too complicated to sell.

He was followed by a demonstration of the method for installing heating cable on dry wallboard for ceiling installations by W. C. Ferris of the Y-W Electric Assn., Akron, Colo.

Calculations and technical data were covered by R. G. Wadleigh of San Luis Valley Rural Electric Co-op., Monte Vista; H. S. Smith of Colorado Central Power Co.; temperature control by W. J. Baak, Minneapolis Honeywell; and wiring and code, H. J. Williams, Colorado Cen-

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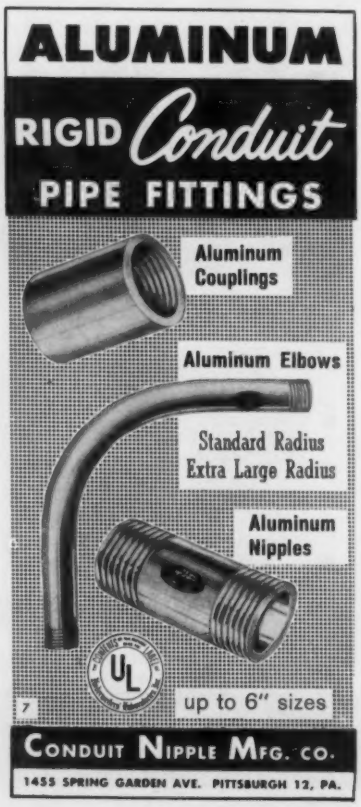

tral Power. Each gave examples and much practical working information on application of the data and the code rules. Comfort conditioning was discussed by R. D. Graham of General Electric Co., Louisville, more from the sales aspect, and R. L. Boyd, manager of commercial comfort heating, Edwin L. Wiegand Co., Pittsburgh, discussed commercial applications. Most of the speakers from the manufacturers stressed the sales points and the handling of cost comparisons. Simon Halle, NECA manager, Colorado Springs, told that in Minneapolis, to qualify as electric heating installers, examinations and licensing have been enacted.

So pleased with the workshop, the members went into a huddle to develop a state-wide promotion campaign by the sales promotion committee to stress electric heat.

News Flashes

Continued from p 83

and NECA Ninth District Representative Ernest G. Kramm and R. G. Coleman, manager, San Mateo County Chapter, NECA. The low bid failed to list the subcontractors as required under the Sub-Bid Listing Law. New bids were to be taken.

► **Robert E. Noonan,** a former San Diego IBEW business manager who later became first administrative assistant to IBEW president, the late Dan W. Tracy, and more recently Gordon M. Freeman, died in Washington October 3, age 58. He was secretary of the Council on Industrial Relations.

► **Fischbach & Moore** was the low bidder for the electrical construction in the new building in Denver for headquarters for Public Service of Colorado to be finished in 1961. Architects are Berne, Muchow, Baumer & Polivnick, AIA, and Ebasco was the facilities planning consultant; Swanson-Rink & Associates the electrical consultants. Mead & Mount Construction Co. is general contractor.

► **Sunlight Electric Supply** Co. has purchased an Escondido organization in the wiring supply field and has established a new branch there. **Bill Lambeth** continues as manager of the organization at 600 W. Sixth.

► **Black & Kindrick Electric Wholesale** Co. of El Monte has established a new branch in Costa Mesa, Calif.

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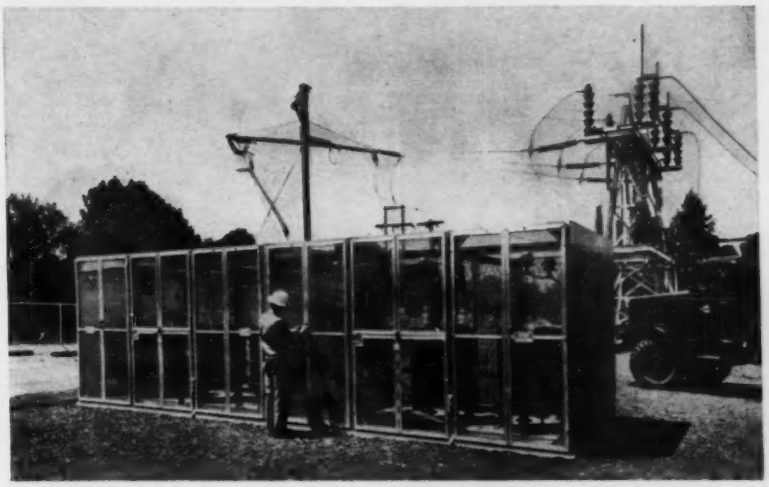
PRODUCT NEWS

New Designs and Applications



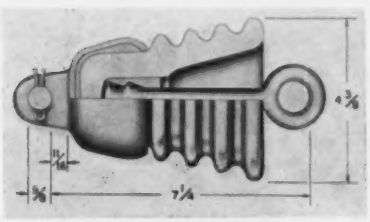
Aluminum Cage

(1) *Aluminum Co. of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa.*

Philadelphia Electric Co. has installed all-aluminum reactor cages near Philadelphia.

By using aluminum, the utility expects service life cost savings over galvanized steel structures as well as the elimination of magnetic materials in the enclosure structure.

The cages were fabricated from components supplied by Alcoa and its distributors.



Dead-Ending Insulator

(2) *H. K. Porter Co., Inc., Delta-Star Division, 2437 Fulton St., Chicago 12, Ill.*

A new strain insulator is being produced at the Lisbon, Ohio, Thomas Works of Delta-Star Division, H. K. Porter Co. Inc. For use on power lines of up to 12.47 kv, the new unit is said to cut over-all costs by as much as 40%.

One insulator is used to do the work of two conventional 6-in. or one 10-in. unit.

Color-Coded Triplex

(3) *Olin Conductors Division, Olin Mathieson Chemical Corp., Chattanooga, Tenn.*

Olin Conductors, formerly Southern Electrical Co., reports the availability of a new improved type of covering known as Hypalon together with Compresto conductor construction in both 7- and 19-wire sizes for service drops and secondary cables. This new covering permits color coding and positive phase identification in secondary networks.

Transformer Fault Detector

(4) *Pennsylvania Transformer Division, McGraw-Edison Co., Box 330, Canonsburg, Pa.*

A new instrument, capable of detecting the existence of a small but destructive hot spot in an electric power transformer—before complete failure and power interruption occurs—was recently announced.

The company claims that excessive overheating of parts in transformers is detected with the new instrument by the analysis of gases given off when materials in a transformer are subjected to excessive heat. These gases accumulate in the transformer, permitting periodic sampling. The amount of combustible gases indicates the condition of the transformer.

Weatherproof Terminal Boxes

(5) *Hoffmann Engineering Corp., 854 Tyler St., Anoka, Minn.*

A weatherproof terminal box for 200-amp, 125/250-v service is now offered by this company.

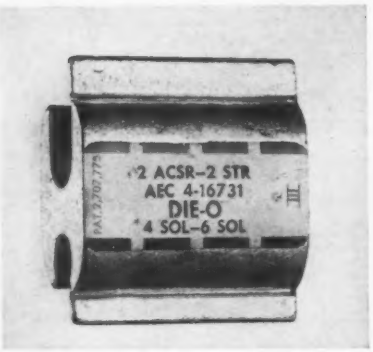
The galvanized steel boxes contain from three to five bus bars to provide neat, easy wiring connections for use in outdoor wiring.

The galvanized steel boxes are 14x11x5 in. deep and are finished with gray hammertone enamel. They have screw-on, removable covers. Each box has a 2½-in. top hub and 1½- to 2-in. combination knockouts in the bottom.

Insulator Washer

(6) *F. A. B. Mfg. Co. Inc., 1249 67th St., Oakland 8, Calif.*

Pictured is the HyGy (short for High Geyser). This machine was designed to wash the insulators of high-voltage transmission and distribution lines. The manufacturer claims that it does not require a man in the cage to aim and trigger the nozzle as the driver of the vehicle has complete control of the truck, boom and remote-operated nozzle.

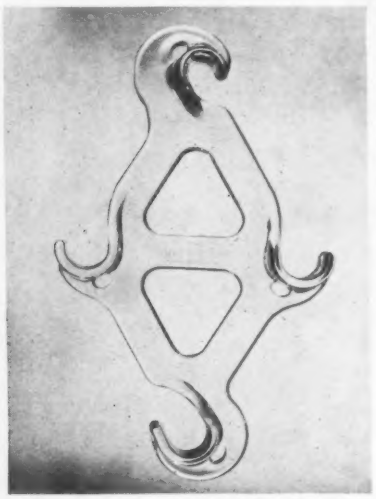


Color-Coded Connectors

(7) *Anderson Electric Corp., P. O. Drawer* 2151, *Birmingham, Ala.*

Anderson has announced a color marking system for its new Dura-Squeeze series connectors.

The connectors are color coded on themselves as well as being packed in a color-coded carton. This color coding shows the proper connector to be used with a given conductor as well as indicating the number and location of crimps, according to the manufacturer.



Cable Spacer

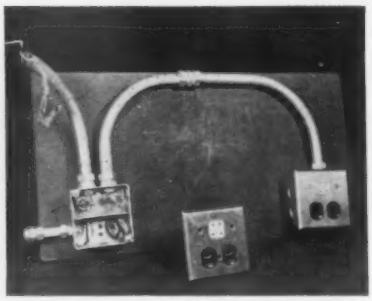
(8) *Anaconda Wire & Cable Co.,* 25 *Broadway, New York* 4, *N. Y.*

Anaconda's new Spinway cable system employs this lightweight spacer in a single size for 5 kv to 15 kv installations. Smooth, one-piece construction makes unit sturdy, resistant to surface contamination. No grommets are required in installation; the lineman makes a wire tie.

Tandem Switches

(9) *Line Material Industries,* 700 *W. Michigan, Wilwaukee* 1, *Wis.*

New switch and power fuse tandems, produced by Line Material Industries, are said to offer excellent fault protection when used to by-pass oil circuit reclosers or breakers. These combinations, available in nominal voltage ratings of 7.2, 14.4, and 23 kv and maximum interruption ratings of 20,000, 16,000, and 9,000 amp, respectively, can be applied on systems up to 14.4/24.9-kv grounded wye.



Conduit System

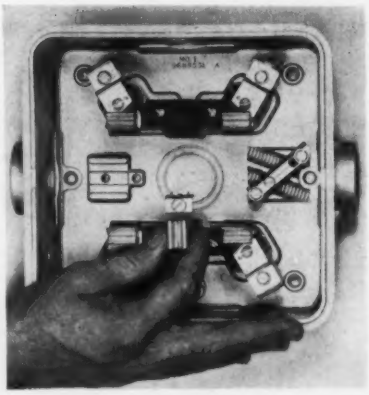
(10) *Dico,* 20 *Blodgett, Clarendon Hills, Ill.*

Dico is the trade name for a new system of divided conduits and wall boxes that provide space for electrical and telephone circuits that must be kept isolated from one another. This device employs a metallic membrane between the two halves of the conduit. Couplings and boxes have been adapted to maintain this separation to comply with electrical practices as prescribed by the National Electrical Code.

Conduit Lubricant

(11) *Electro Compound Co.,* 4145 *W.* 150*th St., Cleveland* 35, *Ohio*

Alum-N-Eas, a new product which is said to stop binding and seizing of aluminum conduit connectors, has been introduced by this company. The manufacturer states the turning action, combined with the presence of Alum-N-Eas, breaks any aluminum oxide on threads. The compound also keeps the air from making contact with the joints, thereby eliminating the formation of any new aluminum oxide, according to the manufacturer.



Meter Socket

(12) *General Electric Co., Schenectady* 5, *N. Y.*

A new line of die cast aluminum meter sockets with a jaw and connector assembly adaptable to either copper or aluminum wire has been announced by General Electric's meter department, Somersworth, N. H.

The new outdoor S-2 socket combines a J-shaped wire connector and terminal jaw that provides a continuous current path from the meter terminal blade to the conductor.

According to the manufacturer, the box has 144 cu in. interior space in which a fifth or sixth terminal can be added in the field without tools.

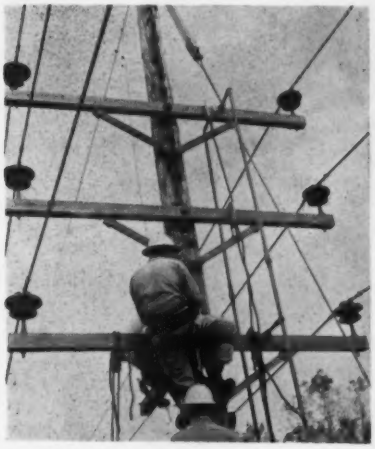
Marker

(13) *Pacific Float Co., P. O. Box* 78, *Dillard, Ore.*

Devised to warn low flying aircraft against collision with transmission line crossings, a new hollow cone marker of light plastic is being introduced to the power industry.

Suspended at strategic points from transmission lines crossing water ways or canyons, the bell-shaped warning markers are kept in constant motion by air currents. The

markers are 20 in. high and 20 in. in diameter at the base, and are color impregnated in international orange.



Barrier

(14) *A. B. Chance Co., Centralia, Mo.*

An Epoxiglas-insulated barrier to protect linemen from backing into energized conductors while working on the "cold" side of the pole has been introduced by this manufacturer. The barrier clamps on crossarm of double-circuit, three-phase, single-pole structures and serves as a guard to assist the lineman in maintaining a safe working distance from the "hot" side of the crossarm. The bright orange color also aids as a visual barrier.

Corrosion Inhibitor

(15) *Dearborn Chemical Co., Merchandise Mart Plaza, Chicago 54, Ill.*

A new two-step system that protects electric cables from corrosion and arc-proofing has been announced by this company. The new technique utilizes No-Ox-Id wrap and No-Ox-Idized asbestos tape.

The No-Ox-Id wrap is applied to lead sheathed cables, allowing a ½-in. lap to eliminate voids and protect all cable area. It is then firmly bonded to the cable by pressure of thumb and fingers.

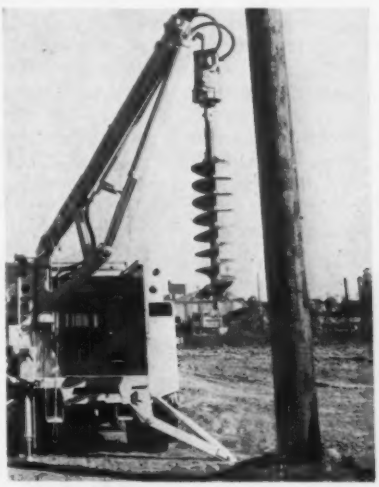
After the wrap has been applied, a spiral half-lap application of No-Ox-Iidized asbestos tape provides arc-proofing protection.

No-Ox-Iidized asbestos tape may also be used alone for arc-proofing protection of neoprene or vinyl-coated cable.

Welding Gun

(16) *Air Reduction Pacific Co., 100 California St., Suite 1000, San Francisco 11, Calif.*

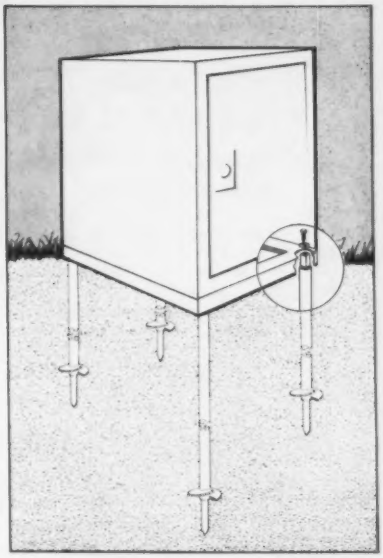
New manual Aircomatic welding MIGet gun and controls have recently been developed by Air Reduction Pacific Co. The gun and controls are designed for use in light to heavy fabrication where numerous short welds, off the ground welding or emergency repairs are necessary.



Corner-Mounted Derrick

(17) *Holan Corp., 4100 W. 150th St., Cleveland 35, Ohio.*

A new corner mounted power derrick—designed especially for working in narrow streets, alleys and congested areas—is being manufactured by Holan Corp. Engineered as a complete unit to avoid body and derrick stresses, the new derrick—known as the 7500—has a horizontal sweep of 110° to permit boring and pole setting behind and to the curbside of the truck. Holes up to 8 ft. in depth can be bored without an auger extension, and 12-ft holes can be bored with an auger extension.



Foundation Anchors

(18) *A. B. Chance Co., 210 N. Allen St., Centralia, Mo.*

The A. B. Chance Co. has designed an anchor that takes the place of concrete pads when mounting distribution transformers in subdivisions. The foundation anchor is installed vertically to support the transformer.

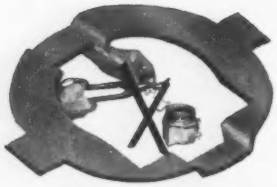
Four anchors are installed by two men using a special hand wrench. The anchors have a threaded end that bolts either to a bracket made of angle iron or special mounting brackets on the base of the transformer.

Safety Hoist

(19) *Ratcliff Hoist Co., P. O. Box 543, Belmont, Calif.*

A new, one-ton safety hand hoist, able to operate in close quarters and with safety, is announced by this company. The maker claims this hoist will not free chain under load, even if control lever is tripped accidentally; nor will it free an interrupted load.

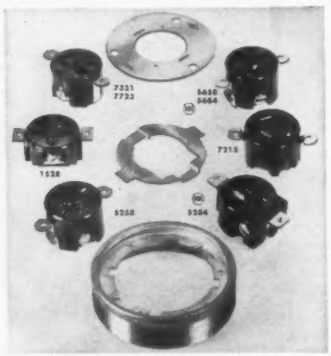
The hoist housing and all load carrying parts are made of shock resistant alloy steel. The complete unit weighs approximately 131½ lb.



This "KEY" Fits Most Popular RECEPTACLES Found at Your DISTRIBUTORS

This "KEY" which has been added to our No. 190 series—*at no extra cost*— was designed to fit most popular size and style receptacles.

The "KEY" drops easily into special slots in adjusting ring—you select the receptacle required and simply "LAY-IN;" then "LAY-ON" receptacle ring. That's all—no more ears to clip—very easy to install.



FULLMAN'S *Adjustable* STEEL BOX

190-N R Series
No Receptacle

Our No. 190 series is a standard 4" octagon, sheet steel box and takes ½" up thru 2⅜" abandon plug. Box-body opening is plenty large for complete hand access from top of concrete to bottom of box. A second tin lid is provided for pouring concrete to very top.

Sales Representatives in all principal Cities

Fullman
MANUFACTURING COMPANY
1209-1215 JEFFERSON ST.
LATROBE, PENNSYLVANIA

Junction Box Adhesive

(20) *Permacel Inc., U. S. Highway 1, New Brunswick, N. J.*

A new epoxy adhesive that will enable an electrician to install a junction box in two minutes on tile or masonry walls or ceilings, as compared with about 15 minutes by the conventional expansion bolt or plug method, has just been put on the market by Permacel, a division of Johnson & Johnson.

This new adhesive, it is claimed, should find many uses in hazardous areas, difficult to reach locations and in prestressed concrete walls that would be weakened by conventional drilling methods.

Coated with the new adhesive, the junction box will remain on the wall, without any sliding, after it has been held in place for five seconds.

Inhibiting Compound

(21) *Jasper Blackburn Corp., 1525 Woodson Rd., St. Louis 14, Mo.*

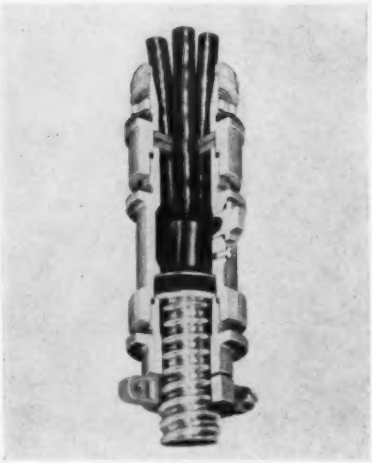
A new sealing and oxide inhibiting compound, which has no harmful effect on rubber products, has been developed in the laboratories of Jasper Blackburn. According to the manufacturer, extensive salt fog and current cycling tests show excellent corrosion protection and conductivity performance. Further, tests conducted by an independent rubber goods manufacturer indicate that this nonpetroleum base grease has no adverse effect on linemen's natural or synthetic rubber gloves.

Safety Cable

(22) *Western Insulated Wire Co., 2425 E. 30th St., Los Angeles 58, Calif.*

The dual advantages of high visibility for safety and ruggedness for utility have been built into a power cable now being manufactured by this firm.

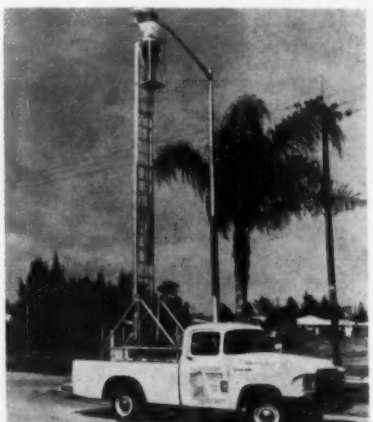
Constructed with an outer cover of yellow neoprene, the new cable is said to be particularly useful in plants and on many other indoor and outdoor projects where power equipment is used. The color is a built-in signal for safety, preventing the hazard of tripping over unseen wires. When used as permanent wiring, the yellow jacketed cable makes it easy to trace or designate a specific circuit.



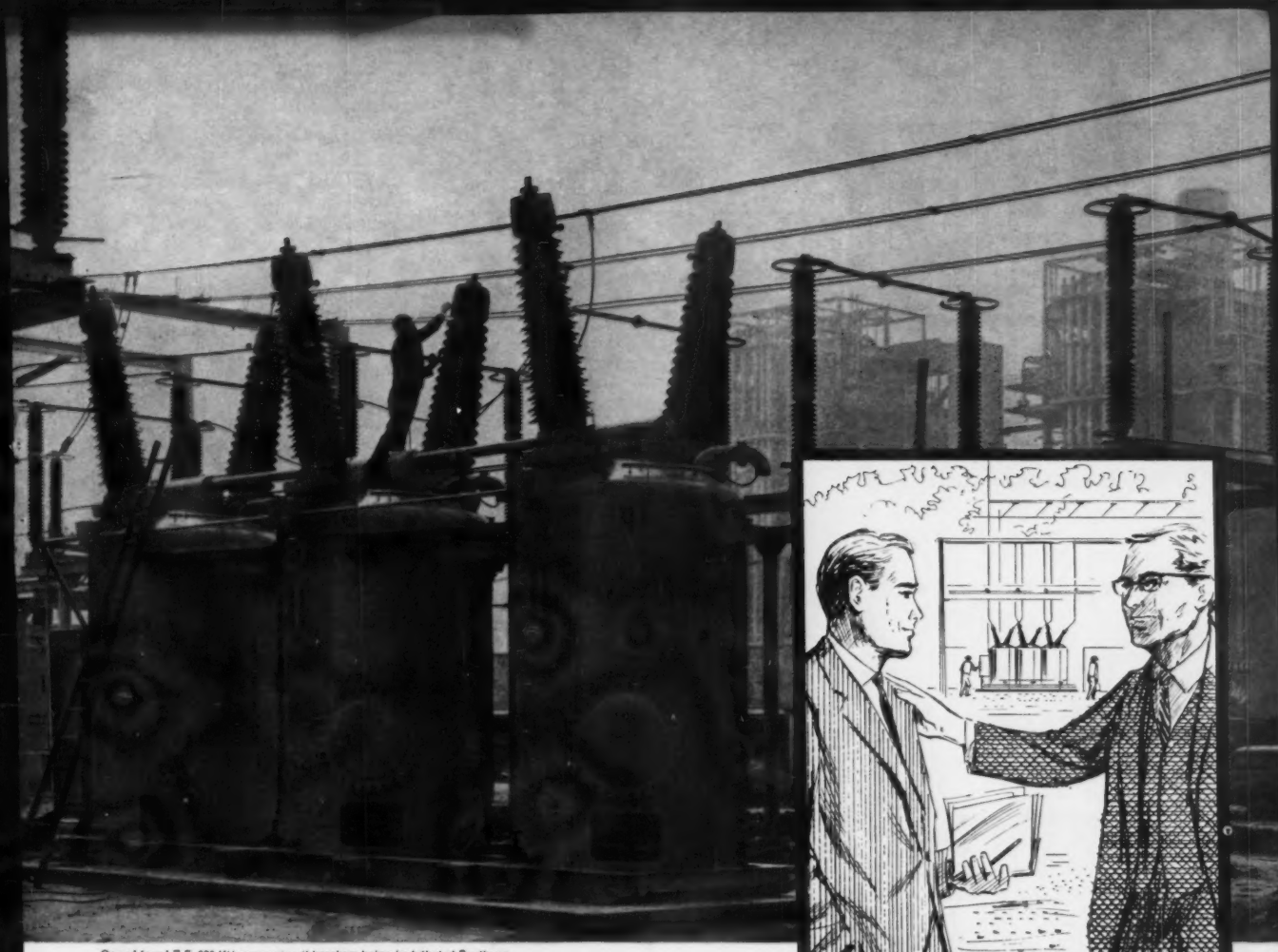
Armor Cable Fitting

(23) *G & W Electric Specialty Co., 3500 W. 127th St., Blue Island, Ill.*

A new line of fittings for all interlocked armor cable has been announced by this company. The new Series 800 fittings not only terminate but also support, ground, mount, and dead-end the cable.



(24) TELESCOPING ALUMINUM TOWER—Outdoor and indoor fluorescent fixtures may be maintained from a single telescoping aluminum tower mounted on a service truck. The telescoping tower is said to reduce parking lot fixture maintenance to a one-man operation. Because it is quickly removed and equipped with locking casters for in-plant maintenance, the tower releases the truck from prolonged tie-ups previously experienced with ladder rigs, the manufacturer points out. Known as Tallescope, the tower telescopes are for working at heights up to 32 ft. It is manufactured by Up-Right Scaffolds, 1013 Pardee St., Berkeley, Calif.



One of four I-T-E, 230 KV power circuit breakers being installed at Southern California Edison Company's new 820-Mw steam station, Huntington Beach.

ANOTHER JOB WELL DONE...

by the Kelman Power Circuit Breaker Division of I-T-E

Doing business for more than 50 years—Southern California Edison Company and I-T-E's Kelman Division:

- **the first 30 KV oil breaker in 1906**
- **the first 230 KV oil breaker in 1937**
- **1000's of breakers between '06 and '60**

When the Southern California Edison Company of Los Angeles decided to boost the output of its new Huntington Beach steam station by adding two computer-supervised turbine-generator units, they selected each of their equipment suppliers with the utmost of care. The successful bidder for four, new, 230 KV power circuit breakers was the Kelman Power Circuit Breaker Division of I-T-E—people with whom this utility has been doing business for more than 50 years.

Back in 1906 the Kelman Electric & Manufacturing Company supplied the then Edison Electric Company with a 30 KV oil breaker. Since that time thousands of Kelman breakers have been put into service as the Southern California Edison Company has expanded its facilities to match the growth of the great California Southland.

Through the years, there has remained the same fine relationship that started fifty-four years ago. It is a business relationship that has been maintained by Southern California Edison Company's insistence on a quality product and I-T-E's determination to continue to supply that kind of product at a competitive price.

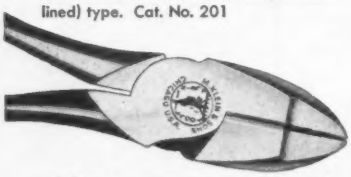
For descriptive literature on I-T-E's field-proven power circuit breakers, write to 1667 North Main Street, Los Angeles 12, Calif., Dept. EWE-962-2.

I-T-E CIRCUIT BREAKER COMPANY
KELMAN POWER CIRCUIT BREAKER DIVISION

KLEINS

for LINEMEN and ELECTRICIANS

The Original Klein Side Cutting Plier—Also available in NE (Streamlined) type. Cat. No. 201



High Leverage Plier—Extra high leverage permits cutting extremely tough wire. Also available in the standard type as shown above. Cat. No. 213-9NE

High Leverage Oblique Cutting Plier—A recently introduced plier designed to cut toughest wire. Cat. No. 228-8

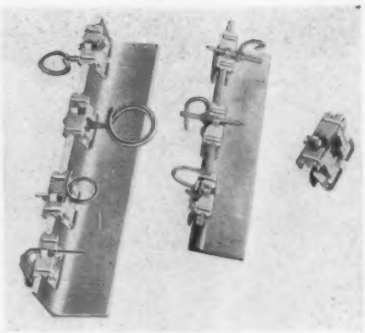
Electrician Conduit Plier—Reams inside and outside of conduit, tightens lock nuts in outlet boxes. Cat. No. 333-8

"Since 1857" the name Klein has stood for the finest in tools and equipment for linemen and electricians. It is the uncompromising high quality back of the name Klein that has won Klein Pliers their place in the hands of men who know good tools. Klein Pliers are now available in a wider variety of styles and sizes than ever before. Be sure the pliers you need carry the Klein trade-mark.

Klein Catalog Free—This new Klein catalog giving complete information on Klein tools and equipment for linemen and electricians will be sent on request. Write for your copy.

Ask Your Supplier—Foreign Distributor: International Standard Electric Corp., N.Y.

Mathias KLEIN & Sons
Established 1857 Chicago 30, U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS



Beam Clip

(25) *Erico Products Inc.*, 2070 *E. 61st Pl., Cleveland 3, Ohio.*

Recently announced by this company is the new B beam clip. Designed to replace present universal clamps and supports, this clip is for use with threaded or unthreaded bridle rings, drive rings and other low-voltage cable, wire and copper tubing supports.

Insulation Tester

(26) *ASEA Electric Inc., 55 New Montgomery St., San Francisco 5, Calif.*

This company announces a surge apparatus to test insulation in low-voltage installations. It is a small impulse generator that produces surges in shapes which correspond approximately to those that occur in atmospheric overvoltages in low-voltage networks.

The surges are harmless to human beings and animals, and will not damage a sound installation. Repeated use of the apparatus will not cause insulation to deteriorate or carbon deposits to form, according to the manufacturer.

Peaking Plant

(27) *Westinghouse Electric Corp., Box 2278, Pittsburgh 30, Pa.*

Self-contained, automatically controlled gas turbine power plants in ratings of 3,000, 7,000 and 12,000 kw have been announced by Westinghouse Electric Corp.'s industrial gas turbine department.

Designed for peaking, reserve capacity or emergency operation, the new units called Econo-Pac can be installed for as little as $80 per kw, based on winter operation, or $100 per kw for summer use, states the manufacturer.

Nonmetallic Cable

(28) *Triangle Conduit & Cable Co. Inc., Triangle & Jersey Aves., New Brunswick, N. J.*

A new plastic jacketed nonmetallic sheathed cable has been announced by this company.

Called Thermo-Triex, the new cable features individual conductors insulated with a polyvinylchloride compound and color coated according to standard industry practices. The outer covering also consists of a special polyvinylchloride compound, which is designed not to deteriorate. This new outer covering is highly resistant to flame, impact, oil, alkalis and acids, according to the manufacturer.

Motor Protector

(29) *Modern Mfg. Co. Inc., 680 Davisville Rd., Willow Grove, Pa.*

A miniature circuit breaker designed to protect small motors in portable power tools and appliances has been announced by this company.

The motor protector attaches to the end of the power cord and will automatically cut off power when the machine is overloaded or overworked. A reset button is used to reset the circuit breaker, which is available in sizes from 3 amp to 10 amp.

Portable Temperature Indicator

(30) *Fenwall Inc., Pleasant St., Ashland, Mass.*

A two-pound battery operated portable temperature indicator has been developed by this company for use in steam generating plants, by consulting engineers, and for general industry. The unit has thermistor sensing probes and batteries that have an estimated life of several thousand hours. It is available in 10 different ranges, spanning -30 F to 350 F.

Portable Elevator

(31) *Witch Marketing Co., 1959 W. Fir Ave., Perry, Okla.*

This company offers its Sky Witch, a portable elevator with load lifting capactiy plus a stable work platform. The Sky Witch collapses to as low as 30 in.; elevates to as high as 24 ft.

Among the six models to choose from, the power may be hand, electric, air motor or gasoline.

BULLETINS ETC.

(32) DISTRIBUTION—Advantages of underground distribution for commercial and industrial areas are given in a brochure offered by R T & E Corp., 1900 E. North St., Waukesha, Wis. Write for bulletin 300.

(33) SPEEDBUS—National Electric Division, H. K. Porter Co., is offering a catalog on its new 100-amp packaged busway for installation in industrial and commercial buildings. The new catalog shows construction features and lists suggested applications. It also contains complete dimensional data, catalog numbers and price information. Write for form No. 698, to National Electric Division headquarters, Porter Bldg., Pittsburgh 19, Pa.

(34) SUBSTATION TRANSFORMER—For use by utility, industrial and consulting engineers, a comprehensive bulletin on custom-designed, liquid-filled substation transformers has been published by I-T-E. Range covered is single- and three-phase, 501 to 10,000 kva, and up to 69 kv. Bulletin 5800-1A may be secured by writing I-T-E Circuit Breaker Co., Department A-4, 1900 Hamilton St., Philadelphia 30, Pa.

(35) SPORTS LIGHTING—Crouse-Hinds has issued a revised edition of its sports lighting bulletin featuring nearly 100 suggested lighting layouts. Bulletin 2721 is available from the company at Syracuse 1, N. Y.

(36) SUBSTATION PLANNING—Advantages of its Regu/Tran unit assembly are given by Allis-Chalmers in bulletin 61B9695, available from its Milwaukee, Wis., headquarters. The assembly consists of three single-phase regulators mounted on a three-phase power transformer with three by-pass switches located above the regulator.

(37) BREAKER AND LOAD CENTER LINE—An eight-page booklet presents Murray Mfg. Corp.'s circuit breaker and load center line. It features the MP breaker line and explains how contractors can use the Guaranteed for Life program to increase sales and profits. For a copy of the bulletin, write to company at 1250 Atlantic Ave., Brooklyn 16, N. Y.

(38) WIRING—A 24-page catalog issued by Ettco Wire & Cable Corp., 46-50 Metropolitan Ave., Brooklyn 37, N. Y., includes descriptions, tables and specifications relating to various kinds of conductors.

(39) MAINTENANCE—A manual containing data on procedures and equipment for measurement of insulation leakage at high voltage and voltage breakdown tests has been announced by Associated Research, 3777 W. Belmont Ave., Chicago 18, Ill. Listed as D-62.

(40) METAL FRAMING—A two-color, 36-page illustrated handbook on metal framing construction and maintenance is addressed to the mechanical and electrical field. It is available from Unistrut Products Co., 933 W. Washington Blvd., Chicago 7, Ill.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after January 1

Please send me, without obligation, the new product information or catalogs.

If described in Product News, circle item number

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NAME ..... TITLE .....

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*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

*Trademark

"We like to do business with the Fanner Superformed Folks"... PURCHASING AGENT

"Our transmission-line construction is done on a 'bid-job' basis. But we insist on reliable sources for *every item* of work and equipment, because we must protect customer service and large investments.

"Take even a relatively small item, like connecting materials . . . we find that the Fanner folks, both Factory and Agent, are the kind we like to deal with. They *measure up* . . . Quality, Service, Price, Performance . . . and, above all, *INTEGRITY*."

No one knows better, than a Purchasing Agent, "Who's Who" among the Suppliers.

A-1607A

FANNER Superformed* with a "PROTECTIVE TWIST"

ARMOR RODS... Protect long-span T&D lines at supports

LINEGUARDS... Protect short-span T&D lines at supports

PATCH RODS... Repair damaged conductors

TAP ARMOR... Protects conductor at tapping points

FANNGRIPS... For dead-ending strands and conductors

FANNSPLICES... Join two ends of conductor wire

PLASTIC PRODUCTS... For conductor surface protection

FANNER
The Fanner Manufacturing Co.
Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

GIBBONS
Power Connectors and Bus Fittings
for COPPER or ALUMINUM
51 Styles 600 Sizes

Made in The West
Send for Catalog

GIBBONS ELECTRIC COMPANY
P. O. Box 63, SANTA CLARA, CALIF.
CHerry 3-6698 918 DiGiulio Ave.
Successors to bus fitting activity of Federal Pacific Electric Co.

FOR SALE—USED INDOOR OPEN TYPE SWITCHBOARD

Consisting of:

2—Westinghouse three phase induction regulators, five percent regulation, 364 KVA, 1000 amperes, 4200 primary voltage, automatic control.
2—Oil circuit breakers for above, double throw, mechanically interlocked, type "F11", 200A, 5KV, Westinghouse. (manually operated).
1—Switching reactor for above.
17—Westinghouse oil circuit breakers, three-pole, 7.5 KV, 400A, 50 MVA, type "F124" manually operated, 48 V.D.C. trip coil. Complete with operating handle thru switchboard.
17—Panels for above, complete with type "S" ammeter and voltmeter, three overcurrent relays, type "CO" one "OB" watthourmeter, two element, three current transformers, one three element ammeter switch.
17—Three pole disconnect switches, 400 Amps, 7500 V. single throw. Complete steel frame for switchboard and necessary copper bus runs.
4—Three pole disconnect switches, 600 A, 7500 V, double throw. Our drawing 54-10862.

TO BE SEEN COMPLETELY ERECTED AT CITY OF RIVERSIDE LIGHT DEPT., CALIF. 3854 MULBERRY STREET

TO BE SOLD COMPLETE OR IN PARTS

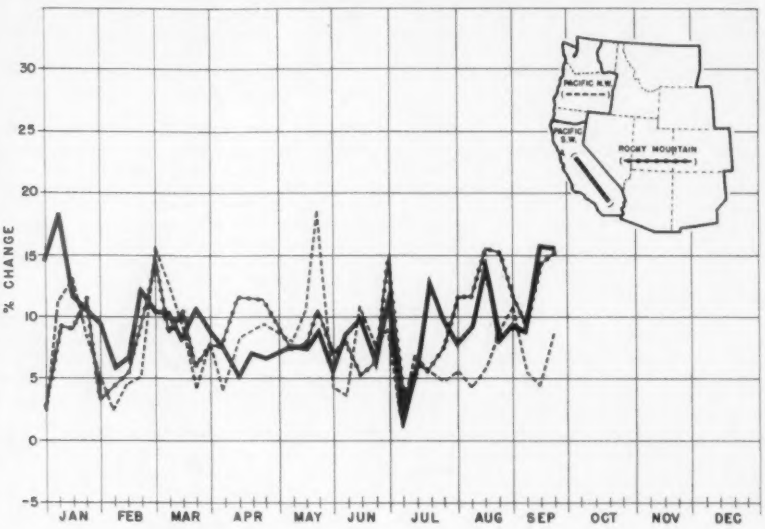
For information concerning equipment write or call

ERHARD BENDER
3854 Mulberry St., Riverside, California
Phone: Overland 6-7575

WESTERN BUSINESS TRENDS &

Output Comparisons

Year-to-Year Kwh Output Changes. Per Cent Change Over Same Week One Year Ago for Region as Indicated in Keyed Map



Trends in U. S. Industry

Incoming new orders for industrial machinery, a leading indicator of future capital investment, have been declining since May, according to the McGraw-Hill Machinery New Orders Index. The drop over the past few months has been on the order of 7%, and machinery companies are anticipating still further declines in their new bookings right through the first quarter of 1961, indicating that 1961 investment in new machinery will be down several percentage points from the 1960 level.

A look at the chart on manufacturing employment on the next page will show that here in the West we are feeling the same pressure, although not to the same degree.

The industrial operating rate has been sliding steadily since the end of 1959. The best estimate at the present time indicates that manufacturing industries, on the average, are operating at about 80% of capacity compared with a rate of 85% at the end of last year. This is considerably below the rate at which companies would prefer to operate. New capacity is being created faster than it is being utilized. Consequently, with the exception of capacity for new products, there is little need for installation of new capacity in 1961.

Relative Wholesale Prices of Electrical Material

	Year Ago	Month Ago	Latest Month
Wire & Cable	133.1	131.4	131.3
Watt-Hour Meters	120.9	120.9	120.9
10-Hp Motors	157.7	136.1	132.0
225-Hp Motors	223.9	229.0	227.9
Hydro Generators	198.5	185.5	185.5
Steam Generators	203.5	203.5	203.5
15-Kva Transformers	133.5	133.5	133.2
50-Kva Transformers	141.2	137.3	134.7
500-Kva Transformers	160.0	149.0	147.1
Dry-Type Transformers	149.6	146.0	146.0
Switch & Fuse Panelboard	132.4	132.4	132.4
Circuit Breaker Panelboard	139.1	136.7	136.7
Indoor Oil Circuit Breaker	182.5	182.5	182.5
Outdoor Oil Circuit Breaker	213.5	181.3	178.7

Source: McGraw-Hill Department of Economics

INDICATORS

Economy at a Glance

Year Ago	Last Month	This Month
5,353	5,808	5,892

PERSONAL INCOME in millions—seasonally adjusted as of Oct. 15 (An index of consumer spending potential)

7,779.8	8,004.8	8,031.3

NONFARM EMPLOYMENT in thousands (An index of total industrial and commercial activity)

1,948.0	1,915.9	1,933.5

MANUFACTURING EMPLOYMENT in thousands (A measure of manufacturing activity)

33.0	29.6	27.3

HOUSING STARTS in thousands of units (Index of new residential customers)

57,658	7,549	35,041

INDUSTRIAL BUILDING CONTRACTS in thousands of dollars (A rough index to the dollars of electrical contracting business six months to a year ahead)

Sources: Business Week, Bureau of Labor Statistics, Construction Daily and Engineering News-Record

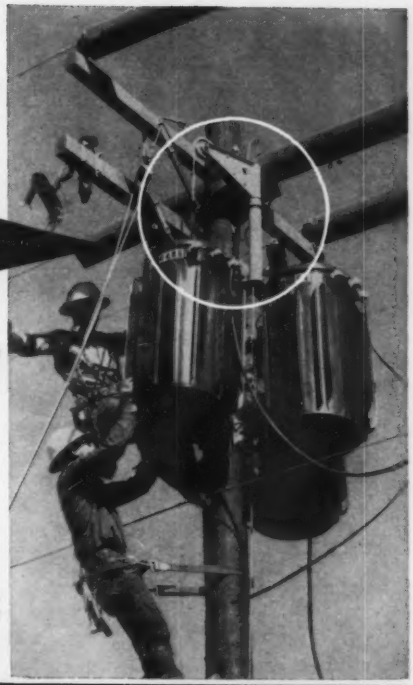
ELECTRICAL TESTING SERVICE
D.C. HI-POTENTIAL
ANY PLACE — ANY TIME
- INSULATION RESISTANCE
- DIELECTRIC ABSORPTION

for New Installations

Preventative Maintenance Programs

Charter Industrial Engineering Co.
465 California St., San Francisco 4, Calif.
Phone: YUkon 1-0427

Cut costs... Provide greater safety with a MO PE CO Transformer Hoist

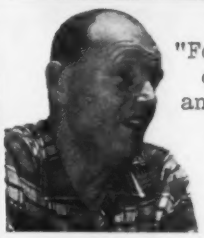


- One position base mounting
- Swivel head permits multiple mounting
- Lightweight 2 piece portable unit (42 lbs.)
- Assembles easily at top of pole
- Tested at 3000 lbs. lift on cable
- Uses steel cable or manila rope

Save time with the MoPeCo hoist. You can install 3 transformers in only 30 minutes!

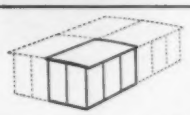
Order through your favorite distributor

Write or call
MORRISON-PELSUE CO.
Denver, Colorado
2001 So. Bannock St. RAce 2-2834



"For a combination electrical field office and storage shed that's quick to move on and off the job, I like Porta House. We have them on several jobs."

Just telephone Porta House collect and get immediate delivery. Prefabricated, bolted, waterproof plywood panels—can be moved on a pick-up truck.



SIZES 6' OR MORE BY 9' OR MORE.

PORTA HOUSE
Ridgely K. Dodge 6767 Broadway Terrace, Oakland, Calif.
Phone collect for immediate delivery: OLympic 2-7237

Distributor (Sales & Rentals): Porta House, 8833 So. Alameda St., Los Angeles 2 • LUdlow 3-1301

Sales Engineer Wanted

For southern California area—experience BSEE—age 28-35. Prefer experience in T & D electric utility field. Top company in its field, profit sharing and retirement plan. Auto and all expenses. Excellent opportunity. Replies held confidential. Write Electrical West, Box #318, 68 Post St., San Francisco 4, Calif.

WANTED

INDUSTRIAL CONTROL ENGINEER

Experienced with electric utility control systems. Man we want probably has 5-10 years' experience designing control systems for a large public utility. Excellent opportunity to associate with engineering department of well established company manufacturing electronic supervisory control systems. Applicants should write to or call

D. L. OESTREICHER
Lynch Communication Systems, Inc.
695 Bryant St.,
San Francisco 7, Calif.
Telephone: EXbrook 7-1471

PROPOSED WESTERN PROJECTS

Rocky Mountain

Denver, Colo., National Jewish Hospital, hospital modernization, $1,000,000. Plans by Eugene D. Sternberg & Associates.

Denver, Colorado State Planning Division, 4-story museum and office for Game & Fish Department, $2,500,000. Plans by Smith & Hegner.

Lakewood, Colo., King's of Boston, department store, $2,000,000.

Ft. Harrison, Mont., Veterans Administration, 160-bed hospital, general and medical hospital, dining hall and kitchen building alterations, installation sewage disposal plant, $5,400,000. Plans by Page & Werner, Great Falls, and Ellerbe & Co., St. Paul, Minn.

Glendive, Mont., Dawson County, courthouse, $549,860.

Great Falls, Mont., U.S. Engineers—Seattle, missile launch facilities, $40 million. Plans will be distributed to selected list bidders from Los Angeles office, Corps of Engineers.

Albuquerque, N. M., J. L. White Corp. and Winrock Enterprises, hotel, $1,000,000. Plans by Victor Gruen Associates, Los Angeles.

Rudioso, N. M., Rudioso Hotel Corp., 6-story hotel, swimming pool, $1,500,000.

Hill Air Force Base, Utah, U. S. Engineers—San Francisco, two-story air freight terminal, office space and mechanical conveyor system, $1,000,000. Plans by Snedaker, Budd, Monroe & Associates, Salt Lake City.

Salt Lake City, Utah, syndicate, 4-story medical building, $1,000,000. In care of J. N. Clawson, architect.

Salt Lake City, Salt Lake City Corp., public safety building, $6,000,000. Plans by Harold K. Beecher & Associates.

Hawaii and Alaska

Elmendorf Air Force Base, Alaska, U.S. Engineers—Anchorage, airfield lighting and streets, roads and storm drainage, $282,000.

Juneau, Alaska, Hieberg Contracting Co., 200 houses, $4,800,000.

Juneau, Alaska, W. Stutte, supermarket addition for shopping center, $475,000. Plans by L. A. Forrest.

Honolulu, Hawaii, Developers Mitsuyuki Kido and George M. Hasegawa, 6-story office, underground parking, $2,000,000. Plans by Lemmon Freeth Haines & Jones.

Honolulu, R. C. Yap & Co., 30-story office, $10 million. Plans by I. M. Pei & Associates, New York.

Waikiki, Hawaii, Queen Development Co., three 14-story cooperative hotels, $2,500,000.

Waikiki, Mr. and Mrs. Wilfred Chong, luxury apartment, $600,000.

Pacific Southwest

Claremont, Calif., Claremont Unified School District, high school, $1,002,000. Plans by Balch-Hutchason & Perkins, Los Angeles.

Fontana, Calif., Colossus Inc., amusement park, $3,000,000. In care of Sandy Howard Productions, Los Angeles.

Granada Hills, Calif., Renaldi Estates, 70 dwellings, $1,012,600. Plans by Unger & Associates, Los Angeles.

La Habra, Calif., S & L Developers, 68 dwellings, $1,149,700. Plans by Bob Albert, Whittier.

Lompoc, Calif., U. S. Engineers—Los Angeles, calibration laboratory, missile assembly building, modification missile launching training facility, Vandenberg Air Force Base, $18,650,000.

Los Angeles, Calif., Louis Lesser Enterprises Ltd., 20-story apartment, $6,000,000. Plans by Daniel, Mann, Johnson & Mendenhall.

Los Angeles, Los Angeles Harbor Department, 1,793 boat marina, $6,157,942. Consulting engineers, Mofatt & Nichol, Long Beach.

Los Angeles, Board of Supervisors, interns and resident physicians dormitory, $2,661,000. Plans by Arthur Froelich & Associates, Beverly Hills.

Van Nuys, Calif., W. & H. Vandwen, 100 dwellings, $1,500,000. Plans by Duncan & Conroy, Los Angeles.

Van Nuys, Trans World Financial Corp., 61 dwellings, $1,380,000. Plans by Ridgley Wexler, Los Angeles.

Westminster, Calif., Alco Pacific Construction Co., 115 dwellings, $1,380,000. Plans by Robert Barnett, Beverly Hills.

Las Vegas, Nev., Clark Co., jet airport, terminal building, runways, $4,500,000. Plans by Welton Becket.

Pacific Northwest

Vancouver, B. C., Vancouver School Board, high school additions, $1,000,000.

Alviso, Calif., Alviso School District, elementary school, voted $1,300,000 bonds

Daly City, Calif., Mary's Help Hospital, hospital, $10 million. Plans by Stone, Marraccini & Patterson Architects, San Francisco.

Sacramento, Sacramento City Unified School District, high school, $3,900,000. Plans by Satterlee & Tomich and Raymond R. Franceschi.

San Jose, Calif., Eastside Union High School District, high school, $2,000,000. Plans by Walter, Price & Porter.

Santa Cruz, Calif., Santa Cruz City High School, high school and swimming pool, $1,600,562. Plans by Reid, Rockwell, Banwell & Tarics, San Francisco.

Stockton, Calif., College of Pacific student residence center, $2,000,000. Plans by Bissel & Eckland, Clowdsley & Shipple and Mortensen & Johnson.

Sunnyvale, Calif., Sunnyvale Elementary School District, two schools and addition to existing buildings, voted $2,000,000 bonds.

Portland, Ore., Board of Higher Education, Portland State College science building, $2,340,000. Plans by Skidmore, Owings & Merrill.

Anacortes, Wash., Skyline on Burroughs Bay Inc., resort with moorage facilities, lodge, $2,000,000. In care of Dr. A. J. Neils, Bellingham.

Longview, Wash., Twin City Development Co., shopping center, $2,500,000. Plans by R. E. Newhall.

Olympia, Wash., Pacific Corp., shipping container plant, $1,000,000.

Renton, Wash., School District 403, elementary school, $500,000; junior high school, $1,000,000; enlarge and alter high school, $500,000. Voted $3,000,000 bonds Sept. 13.

Richland, Wash., School District 400, high school, voted $3,000,000 bonds Sept. 13. Cowan & Paddock, Yakima, architects.

Seattle, Wash., Seattle Pacific College, two dormitories and a dining unit, $1,300,000.

Seattle, University of Washington, underground utility tunnel, $1,477,000.

Seattle, West Seattle General Hospital Corp., 80-bed hospital, $1,000,000. Plans by Smith & Graff.

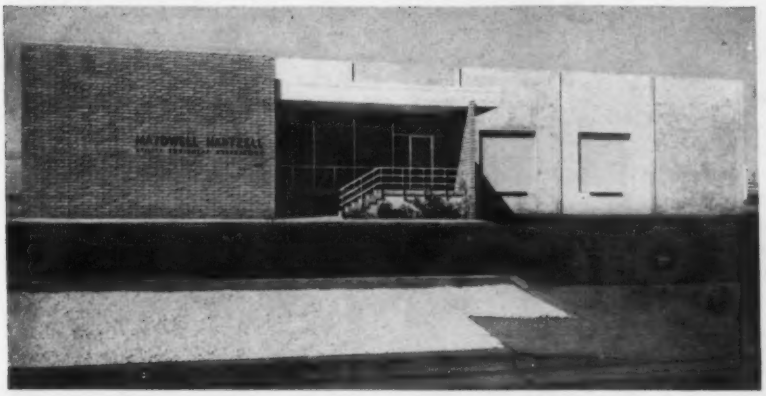
Seattle, University of Washington, 600-man housing $3,000,000. Plans by Kirk, Wallace & McKinley & Associates.

Seattle, Ballard General Hospital, 31-bed addition, $1,000,000.

Tacoma, Wash., Metropolitan Park District, voted $1,300,000 special levy Sept. 13, aquarium, Point Defience Park, $250,000. Sitts & Hill, consulting engineers.

Tacoma, Clover Park School District, voted $1,300,000 bonds Sept. 13, high school, $2,750,000. D. F. Burr & Associates, architects.

Manufacturers—Distributors



Maydwell Hartzell Utility Equipment Corp. has moved into this new office and warehouse building at Phoenix. Covering about 8,000 sq ft, the reinforced concrete building is located in the airport area. Land and building are owned by the corporation, a subsidiary of Maydwell & Hartzell Inc., Pacific Coast firm representing manufacturers of transmission, distribution and communication equipment. The Phoenix operation is under supervision of C. B. Read

Celebrates Anniversary

Electrical Distributing Co. of Phoenix celebrated its 20th anniversary with the opening of a new warehouse at 1534 E. Washington St. at an open house for contractors, dealers, architects and engineers. Display booths, exhibiting new and standard products, were located in the new warehouse and were staffed by manufacturers' representatives, including Anaconda, Bryant Electric, Thomas Industries, H. K. Porter, General Electric, Sylvania and others.

The company was founded in 1940 with two employees and a small space in a store building. Closed in 1942 when the owner, Samuel B. Schurgin, enlisted in the Army, it was resumed in September 1946, in larger quarters; was moved again in 1950 and in 1955. It now occupies some 15,000 sq ft in three warehouses with four salesmen covering the entire State of Arizona and parts of New Mexico, California, Nevada and Old Mexico.

► The **George E. Honn Co.** has moved to its new office and warehouse at 560 Third St., San Francisco 7. The phone number remains the same, SUtter 1-7352.

► **E. C. Phillips,** formerly with Coast Electric Co., has opened his own organization, **Phillips Electric Supply** Co., at 903 K St., San Diego.

► Stockholders have approved merger of **Simplex Wire & Cable** Co. and **Hitemp Wires** on a stock exchange basis.

► **Instrument Control** Co. of Minneapolis has appointed **Cassimus** Co., 651 Folsom St., San Francisco 7, as distributor for its resistance welding controls and standards products.

► The **J. W. Reynolds Co.** has moved to 375 Andrew Ave., Salt Lake City 15, Utah. Mail address is P. O. Box 15412.

Hotpoint Distributor Named

Western Appliance Corp. at 201 S. Cherokee St., Denver, has been appointed the full-line Hotpoint distributor in the Rocky Mountain area, according to John F. McDaniel, Hotpoint general sales manager. This marks the first time in eight years that Hotpoint has named an independent appliance distributor.

Effective Oct. 10, the Western Appliance Corp. took over representation in Colorado and parts of Wyoming, New Mexico and South Dakota, according to J. A. Kuske, vice president and general manager. A sales branch office with warehouse facilities will be opened at Albuquerque within a few weeks.

Several employees of the Denver Hotpoint office will be added to the Western Appliance staff. The company will retain its distribution of the full line of Zenith television, radio and sound equipment.

► **Leonard Haseleu** has been appointed sales manager for the Sacramento house of Incandescent Supply Co. by Manager Tom Garvey.

► **Ed Bueschер** is a new representative of General Cable Corp. in the Sacramento and Stockton area under the branch office manager, Dale Buckley.

► **Wayne C. Wells** Co., 6055 N. E. Glisan St., Portland, has taken on the National Acme Co. line.

Square D is serving its customers in the Pacific Southwest region from new quarters in Los Angeles. The facility at 4301 Valley Blvd. becomes the Los Angeles assembly plant, counterpart of the Western Division assembly plants previously established in San Francisco, Seattle and Denver. Facilities include assembly plant, warehouse and service shop. R. L. Russell is Pacific Southwest regional manager. John Miller is plant superintendent. Marketing functions are under district sales managers: L. E. Krauss, Los Angeles; E. C. Butts, San Diego; W. R. Harm, Phoenix; A. E. Linzer, Honolulu

Graybar Electric Co. has moved its Northwest District office to a new building at 1919 Sixth Ave. S. in Seattle's commercial and industrial district. In addition to the 75,000 sq ft of warehouse space, the building has ample docking, siding and customer parking facilities. Management personnel for the district, which serves branches in Oregon, Washington and Montana, includes J. P. Lawton, manager; D. B. Eardley, sales manager; L. A. Peterson, operating manager; C. C. Bradbury, financial manager

► **Emerson Electric** Co. has developed a training course for electrical contractors and other installers of electric heat. Designed to be given in one session, the course consists of a 48-page training manual with supplements, flip charts and demonstrations. Emerson distributors will sponsor the training program in cooperation with local electrical utilities. The company's regional electric heat specialist will be on hand to aid in the sessions.

► **Weaver Electric** Co. is building a $250,000 shop and office building in Denver's expanding northeastern industrial section. The structure will house administrative and sales personnel and shop employees. Established in Denver in 1910, Weaver distributes new and rebuilt electric motors, generators, transformers and compressors.

► The American Brass Co. has officially changed its name to **Anaconda American Brass** Co. Company President Richard M. Stewart said that the name change will not affect the company's operating policies. A wholly owned subsidiary of Anaconda, it will continue to have its headquarters in Waterbury, Conn.

► **National Supply** Co., Tubular Products Division, is closing its San Francisco office on January first. Dane Egbert, its manager, will become a manufacturers' representative under the name of **Egbert and Associates,** with headquarters at 506 Russ Bldg. in San Francisco. The firm will handle the conduit line. **Arthur and Allen** will continue to handle the underfloor duct.

► **The aluminum industry** recently celebrated its birth and growth in the Pacific Northwest. In 1940, the first aluminum produced west of the Mississippi was made at Vancouver by **Aluminum Co. of America.** Today, eight northwest smelters, owned by five primary aluminum producers, jointly contain 28.7% of the nation's capacity to produce the metal. With more than 100,000 northwest citizens deriving their livelihood from the industry, an estimated 8,500 are employed directly by the five major producers. Annual aluminum pay roll in Vancouver and Clark County alone is more than $8,000,000, with about 1,200 employees at Alcoa's pioneer plant.

► G. M. Howard & Associates, San Francisco manufacturers' representative, has changed its name to **Howard & Goepp** Co. The firm, which covers northern California and northern Nevada, is located at 1301 6th St. in San Francisco. **Walter Goepp** is manager.

► **Andrew L. Polich** Inc., 734 N. W. Glisan St., Portland, has taken on the States Co. line of meter test equipment. The territory includes Oregon and Washington.

► The **Guy de Leuze** Co. has taken on two new lines and is increasing its warehouse space at 1923 Bryant St., San Francisco 10. The firm has been appointed northern California representative for the Keystone Electric Mfg. Co. of Philadelphia, Pa., and of Project Fixture Mfg. Co. of Rockville Center, N. Y. It will carry complete stocks of Keystone commercial and industrial lighting fixtures and of Project's residential fixtures. **Bill Walker** has been added to the firm to handle quotations and telephone inquiries.

► **Trane** Co. will locate a $1 million air conditioning manufacturing plant at Kearns, Utah, according to **LeRoy J. Poehling** of La Crosse, Wis., who will manage the new plant. The new location is in the vicinity of 5000 West and 4715 South in what was at one time wartime Camp Kearns. First unit will be used for light manufacturing and assembly of air conditioning units.

► **C. W. Silver** Co. recently opened a $200,000 electrical equipment center at 535 W. 7th South, Salt Lake City, for the servicing of heavy duty equipment and motors. The new building contains 12,000 sq ft of floor space with overhead cranes and other facilities for handling heavy equipment.

► **Ilsco** Corp. has appointed **Maddox Sales** Co., 420 Market St., San Francisco, as representative for the wholesale division's copper and aluminum connector products. Territory includes northern California and northern Nevada.

► **Michel** Bros., 1413 E. 20th St., Los Angeles 11, has succeeded **Agencies** Co. as manufacturers' representative for Anchor's meter mounting and service equipment line.

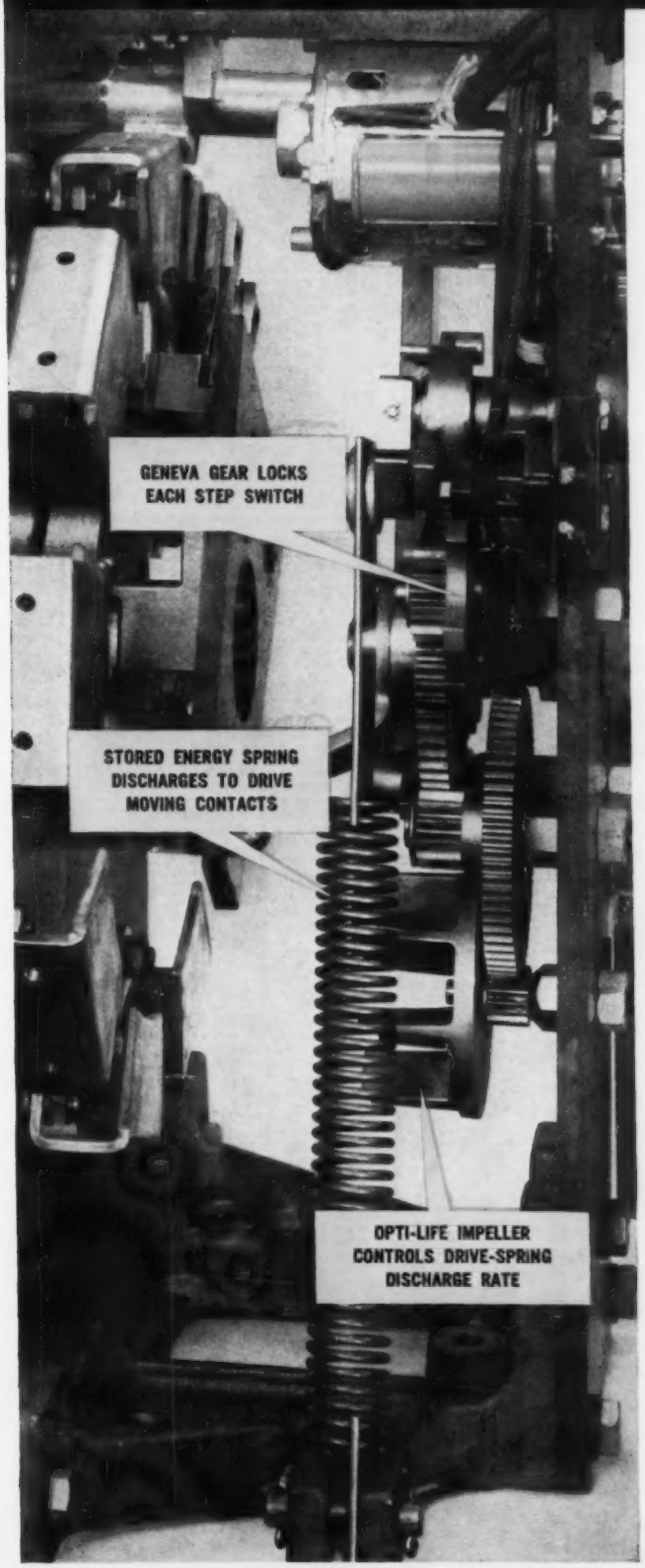
► **Nu-Art Lighting & Mfg.** Co. moves on Nov. 1 to an expanded manufacturing plant at 2360 W. 21st South, Salt Lake City, Utah. In the new plant the floor space is more than doubled under one roof and offers three times the capacity of production through streamlining of the production lines. More space has been allotted to warehousing, both of components and ready-to-ship fixtures. With the move to new quarters, departmentalization has been improved and specialized machinery procedures will provide facilities not only for production but for experiment with new lighting devices.

► **Clark Controller** Co. opened a new office and warehouse at 1770 Yosemite Ave., San Francisco 24. The phone number is VAlencia 6-8550. **D. J. Belock** is district manager.

► **H. T. Dutter,** Los Angeles manufacturers' representative, has moved to new offices at 3156 Wilshire Blvd. Among lines handled are Day-Brite Lighting, Lightcraft and Tomic Sales & Engineering.

► **Century Electric** Construction Co. has moved from 312 Broderick St. in San Francisco to a new location at 221 Oak St. **Pat Furlong** is president of the company.

ANOTHER STEP AHEAD IN VOLTAGE REGULATION


GENEVA GEAR LOCKS EACH STEP SWITCH
STORED ENERGY SPRING DISCHARGES TO DRIVE MOVING CONTACTS
OPTI-LIFE IMPELLER CONTROLS DRIVE-SPRING DISCHARGE RATE

CONTROLLED REGULATOR SWITCHING SPEED

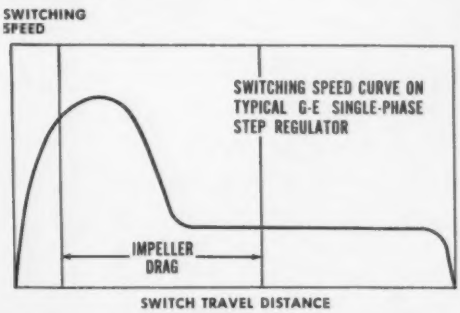
General Electric voltage regulator switches operate 20 years without inspection . . . give you maximum contact life

As regulator users know, there is an optimum tap-changing speed for maximum contact life. Optimum speed must be *controlled* and *non-linear*.

General Electric's exclusive Opti-life switch satisfies these requirements. Results: contacts "break" fast to reduce arcing. Contacts "make" at a calculated rate to (1) reduce mechanical abrasion of contacts, and (2) reduce arcing from contact "bounce."

Truly *controlled* speed of General Electric Opti-life switches is achieved by a fast-action drive, *plus* an oil-immersed impeller which dampens switch velocity as contacts close.

Benefits to you: maximum contact life. In fact, it *isn't necessary to periodically inspect* the interior of a General Electric ML-32 regulator. Under normal operation, switch inspection shouldn't be necessary *for at least 20 years.* You save money!


SWITCHING SPEED
SWITCHING SPEED CURVE ON TYPICAL G-E SINGLE-PHASE STEP REGULATOR
IMPELLER DRAG
SWITCH TRAVEL DISTANCE

FOR MORE REASONS WHY G-E regulators cost less on the line—see your General Electric regulator representative. Or, write General Electric Company, Section 456-05, Schenectady 5, N. Y. *Voltage Regulator Product Section, Pittsfield, Mass.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

For phone number of closest representative see advertising index in back of book.

Estimator's Guide

Prices shown are for new construction cost in place. Quotations furnished by LeRoy Construction Service

The figures in this guide, furnished by LeRoy Construction Service, will be kept up to date and published periodically.

This guide is for your use. Will you please let the editor know if there are other figures or ideas which would make this section more valuable to you?

Residential Wiring

PER OUTLET, 120 V—2 WIRE		
Knob & tube	Each	8.50
Nonmetallic cable	Each	8.00
Armored cable (BXL)	Each	16.00
EMT	Each	20.00
Conduit rigid	Eeach	23.00
PER OUTLET, 230 v—3 Wire (RANGE—OVEN—WALL HEATER)		
Nonmetallic cable (Romex)	Each	14.00
Flex conduit (Greenfield)	Each	22.00
EMT	Each	23.00
SERVICE & PANEL		
Light panel & service 50 amp lugs 120/240 v—3 wire 4 1 pole circuit, 15 amp fused		70.00
Light panel & service 100 amp ACB 120/240 v—3 wire 4 1 pole circuit, 15 amp 2 2 pole circuit, 20 to 50 amp		150.00
Light panel & service 100 amp—ACB 120/240 v 6 1 pole circuit, 15 amp 3 2 pole circuit, 20 to 50 amp		165.00
Light panel & service 100 amp—ACB 120/208 v, 3 phase, 4 wire 8 1 pole circuit, 15 amp 2 2 pole circuit, 20 to 50 amp 2 3 pole circuit, 15 to 30 amp (Required for air conditioning system)		225.00
INSTALL LIGHT FITURES (Fixtures Purchased on Allowance)		
Incandescent	Each	4.00
Fluorescent	Each	5.00
Yard light	Each	5.00
Bathroom exhaust fan	Each	50.00
Garden pedestal light fixture	Each	40.00

Commercial Wiring—Conduit

RIGID GALVANIZED

	Per C
½"	49.00- 54.00
¾"	62.00- 68.00
1"	79.50- 87.00
1¼"	103.00-115.00
1½"	121.50-132.00
2"	160.00-175.00
2½"	229.00-252.00
3"	298.50-325.00
3½"	365.50-401.00
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	Per C
½"	34.50- 38.00
¾"	43.50- 48.00
1"	58.00- 64.00
1¼"	83.00- 90.00
1½"	70.50- 76.00
2"	103.00-112.00

Commercial Wiring—RHW

WIRE 600 V—75°

	Per M
750 mcm, stranded	2,011.00-2,090.00
700 mcm, stranded	1,867.00-1,940.00
600 mcm, stranded	1,675.00-1,742.00
500 mcm, stranded	1,401.00-1,457.00
400 mcm, stranded	1,140.00-1,185.00
300 mcm, stranded	923.00- 960.00
250 mcm, stranded	830.00- 860.00
No. 4/0, stranded	690.00- 717.00
No. 3/0, stranded	567.00- 589.00
No. 2/0, stranded	451.00- 965.00
No. 1/0, stranded	378.50- 393.00
No. 1, stranded	322.50- 335.00
No. 2, stranded	240.00- 249.00
No. 4, stranded	182.50- 190.00
No. 6, stranded	137.00- 142.00
No. 8, stranded	106.50- 110.00
No. 10, stranded	80.50- 83.00
No. 12, stranded	66.00- 68.00
No. 14, stranded	57.00- 59.00
No. 8, solid	99.00- 102.00
No. 10, solid	75.00- 78.00
No. 12, solid	61.00- 63.00
No. 14, solid	52.50- 54.00

Commercial Wiring—TW

WIRE 600 V—75°

	Per M
750 mcm, stranded	1,850.00-1,924.00
600 mcm, stranded	1,537.00-1,598.00
500 mcm, stranded	1,300.00-1,350.00
400 mcm, stranded	1,017.00-1,057.00
300 mcm, stranded	850.00- 882.00
250 mcm, stranded	750.00- 780.00
No. 4/0, stranded	635.50- 660.00
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No. 1/0, stranded	356.50- 370.00
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No. 14, stranded	51.50- 53.00
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Conduit and wire not included

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Surface	7.00
WP	8.00
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15 amp	9.00
15 amp WP	10.00
Clock outlet	9.00
Floor outlet, flush	17.00
Floor outlet, pedestal type	23.00
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Outlet, 240 v, 4 wire, 3 phase, 30 to 50 amp	16.00
Switch, single pole	9.00
Switch, double pole	10.00
Switch, 3 way	10.00
Switch, single pole w/pilot	12.00
Switch, momentary contact	10.00

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GREENFIELD FLEXIBLE CONDUIT

	Each
Fractional hp, 120 v, 1 phase	11.00
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5 to 10 hp, 240 v, 3 phase	14.50
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For Sealtite add 25%	
For explosionproof add 50%	

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200 amp, 3 pole, 240 v	84.50
400 amp, 3 pole, 240 v	178.00
600 amp, 3 pole, 240 v	280.00
30 amp, 3 pole, 575 v	22.00
60 amp, 3 pole, 575 v	36.00
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Duct No 4, single run, including junction boxes and misc. ftgs, etc. Per ft	3.20
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Pedestal underfloor duct outlet, telephone Each	14.00

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Carol®

Protected-Profits Inventory Control Plan

When business is good—*but* your profits are taking it on the chin—just look at your inventory! Dead stock on your shelves—items that are obsolete or too slow-moving—knocks out profits every time.

Profits start with *buying*—the *right* merchandise . . . at the *right* price . . . in the *right* quantity . . . and with the *right* service and cooperation to insure rapid turnover.

That's why it'll pay you to know about the **Carol Protected-Profits Inventory Control Plan** . . . a newly developed service designed to:

- **Insure maximum turnover**
- **Eliminate obsolescence**
- **Insure adequate inventory to fill all orders promptly**
- **Insure balanced inventories**
- **Protect your profits**

STOP TAKING IT ON THE CHIN . . . Ask your Carol salesman for full details on the "Carol Protected-Profits Inventory Control Plan"—or write, wire or phone Carol Cable Company, Pawtucket, Rhode Island.

When you call for cable—call for Carol!

Portable Cords • Power Supply Cable, Types W & G • Arc Welding Cables • Cord Sets • Asbestos Types • Plastic Jacketed Cords • Thermostat Wires • And Many Others

CAROL CABLE COMPANY

Division of the Crescent Company, Inc., Pawtucket, R.I.

SYMBOL OF COMPLETE SERVICE

Delta-Star transformers are an increasingly familiar sight at utility, industrial and commercial installations throughout the West today—*with good reason.* Complete, fully-integrated manufacturing facilities... producing a full range of transformers, pole mounted, substation and dry types, through 5000 kva, single and three phase. Direct, personalized Delta-Star service on your transformer needs is provided everywhere in the West through new sales engineering offices in every major city. These new standards of production and service add new meaning for you to a respected trademark.

Delta-Star Electric Division, 1030 Washington Street, San Carlos, California
Offices at Albuquerque, Denver, Los Angeles, Phoenix, Salt Lake City, San Francisco, Seattle.

DELTA-STAR PORTER **ELECTRIC DIVISION**
H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.